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THE COMING CAR-COUPLER—SHALL IT BE AUTOMATIC?

BY WM. S. HUNTINGTON.

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THE time is now at hand when it is comparatively safe for anyone to give his views on this thread-bare subject, providing he does it in a mild, sensible way. It is not long since that persons who dared say "car-coupler" to a railway official were considered cranks and treated as such. In most instances the term was not misapplied, and it is safe to say that not one in a hundred of the couplers that were placed before railway officers for inspection possessed any merit whatever. To such an extent had car-builders and others been worried by the owners or agents of these worse than useless contrivances that they came to regard all new coupling devices as worthless. Occasionally some automatic coupler was given a trial, which only served to strengthen their determination to have nothing to do with *any new couplers*. They could hardly be blamed for taking this course, but in throwing away all the chaff they have lost some wheat that would have been well worth saving. Though keeping along in the even tenor of their way, maiming and killing people with no apparent effort to prevent the increasing destruction of life and limb, it has become clear that something must be done to prevent this unnecessary loss of life. Not only the public at large, but railway officials are taking a more lively interest in the matter than formerly, and the indications are that a vigorous move will soon be made to select and adopt such coupling devices as seem to be up to the required standard of merit. Railway managers have been so slow in the matter that legislative authorities have thought proper to enforce a recognition of the importance and necessity of adopting some device that will render the coupling of cars a safe operation. It is to be regretted that the authorities have found it necessary to act in the matter, for, as a rule, lawmakers know little of the requirements of railway appliances, and unwise legislation in the matter would do more harm than good. Some of the State legislatures have enacted that railroad companies in their respective States shall adopt some form of automatic coupler, while Congress also has the matter in hand; and it would seem that if there is to be any legislation in the premises, the whole question should rest with the latter. It is obvious that whatever coupling device is adopted it should be uniform throughout the country, and local authorities should not tinker with the matter at all, but leave it to Congress; and if the general government makes a move in that direction, it would be well to appoint a committee of experts from among well-known practical men of undoubted integrity to test such devices as appear to have sufficient merit to warrant a trial. It has been said by some railroad men that life is too short to make a thorough examination of upwards of three thousand patent couplers and select a half-dozen of the best for trial, but it should be remembered that nothing good can be secured without some labor and painstaking, and moreover the great labor attending the selection of the best couplers for trial is more fancied than real. A committee of five experts might, by dividing the work in the patent-office into sections, each one taking a section, dispose of five hundred models, or drawings where there are no models, in a day. Let each one make a note of such as he would consider worthy of special notice, and when all the models and drawings have been examined, let a committe of the whole again examine those that have been marked as of superior excellence. As a rule the worthlessness of these coupling devices are apparent at a glance and can be disposed of without delay, and a week, or at most ten days at the patent office should enable the committee to select all that would be worthy of trial. Thus it would be an easy matter to test the candidates for general use and render an impartial decision as to their relative merits. No doubt if such an arrangement were carried out, some of the financial backers of these contrivances would be on hand to swell the bank accounts of the members of the committee, but the right men for that place would not accept bribes. This has been urged as an objection to such an arrangement, but the idea was born of the readiness with which many railway officials "divy" with those who furnish them with supplies of inferior quality at good prices, or sell them alleged improvements that are a source of trouble and expense rather than a benefit. "But," as a prominent railway official remarked a few days since, "it is evident that something must be done by way of preventing this needless slaughter of brakemen and others in coupling freight-cars. The only way out of this difficulty is to select the coupling device that we believe to be the best, and put it to immediate use, and not delay any longer for fear we shall not get the best. It is clear that if we do not take the initiative, the authorities will compel us to do something that would be disagreeable, and not for the best interests of either the railway community or the public at large."

A large share of the public have become so uncharitable or unreasonable as to charge railway managers with a total disregard for the safety of their employés, and assert that they would rather kill a hundred men than pay a few thousand dollars for a safety coupler. In making this assertion these people do not comprehend the almost insurmountable difficulties that must be encountered in providing a safe coupling device that will fill the necessary requirements of such an appliance; nor do they seem to be cognizant of the fact that railway companies pay enormous sums annually for employés who are killed or in-

jured in their service. Do they suppose for an instant that any railway manager is so heartless as to refuse to pay a reasonable sum for a safety appliance that is not loaded down with objectionable features, as is the case with most of the so-called automatic safety and other complicated impractical coupling contrivances that have flooded the country during the past decade? Enough money is paid every year to the victims of coupling accidents—or their families, in case of fatal injury—to purchase a first-class safety coupling appliance, if it were to be had; and it is hard to believe that there is a man living who would wantonly destroy life and limb when the very prevention of these accidents would pay all expenses now attendant thereupon. If a company has been in the habit of paying $50,000 a year, more or less, for killing or injuring employés engaged in coupling, they would willingly pay double that sum for a device that would effectually prevent such accidents, if satisfactory in other respects. The paying for injury is repeated every year, or as often as accidents occur, whereas one payment for the safety coupling suffices for all time; so that when the right coupling is found and brought into universal use, many valuable lives will be saved and much money by the railway companies, not to mention the avoidance of the misery and suffering of the maimed, and the grief of widows and orphans.

In view of the foregoing facts it is now in order to cast about for some coupling arrangement that is at once cheap, durable and reliable. By "cheap," it is not meant that some shabby affair that can be had for a trifle should be adopted, but that large prices shall not be paid for inferior articles if something satisfactory can be had at a moderate expenditure. The cost of coupling devices ranges from the "sticks" that cost a few cents per car, up to the automatic couplers which cost from $30 to $50 or more per car, and are objectionable on account of cost and lack of merit. The "stick" has been tried, and is not satisfactory. Mr. Charles Paine, when General Superintendent of the Lake Shore Road, equipped his freight trains with coupling sticks, but they soon went out of use. Although they contributed somewhat to the safety of the men, they were broken and lost, and many of them were thrown away by the men who did not like them, and therefore their use was abandoned. It was a clumsy business to guide a link at the end of a stick long enough to allow the operator to stand out of danger. Couplings were not always made on the first trial, and the sticks were broken after short use by being caught between the draw-heads and crushed, and finally, on many occasions, the coupling had to be made by hand. Some other roads are trying the coupling-stick, but they will soon abandon it. But it does not follow that because the sticks that cost but a trifle are not satisfactory, that the automatic couplers that cost $45 per car, more or less, should be brought into requisition unless they should prove eminently satisfactory in every respect. And it is an open question whether *any automatic coupler* would be satisfactory, putting aside the question of cost. If they were sure to couple at all times they would be an element of safety, but also a source of trouble in operating in yards or where switching is being done. Cars would frequently couple when it was not desired that they should, and if they are set so as to not couple, it requires the presence of the operator in either case, so that it saves no trouble to train or yard men. But it seems from recent trials of automatic couplers that they frequently fail to connect, which is a serious objection. And even if a coupler were so constructed as to act with unvarying accuracy, the above-mentioned objections would remain, and, moreover, they would soon be "knocked out" by the rough usage to which they would be subjected. Although some managers are calling for an automatic coupler, it is safe to say that it will be a long time before they will find one that will behave to their satisfaction in all respects. As to train and yard men, they will be satisfied with any appliance with which they can couple with the link and pin with no possibility of injury to their persons. It is conceded by nearly all railroad men that for freight-cars the best coupling in the world is the link and pin were it not for the danger attending its use. It accommodates the train to all movements, vertical and lateral, and compensates for all irregularities of track more effectually than any other coupling.

A recent invention provides a very simple and effective device for guiding the link so that the coupling is made without the operator going between the cars, and there is no possible chance of injury. The device has been thoroughly tested and is satisfactory in every respect, while it can be applied to any freight car without any alteration, at a cost of less than $4 per car, including royalty. There is yet another patented method of manipulating the link and pin which is more complicated than the one above mentioned, and costs $10 per car, not including royalty. It would seem that railway companies would prefer something of this kind that is perfectly safe and reliable, and can be procured at the prices named, to the more costly and less efficient automatic contrivances. The latter, in most cases require an entire change of draw-tackle and fixtures to apply the automatic couplers, and if one road is equipped with them their cars could not couple with cars of other roads not similarly equipped, and it is thus plain that no such change can be made with satisfactory results. But with the first-mentioned appliances for manipulating the link and pin, and where no change is required, the device can be applied to cars that are in for repairs, or at any time the officers see fit, without trouble. They may apply the devices to one or any number of cars, and send them all over the continent, and they will couple with any cars that are coupled with link and pin, and in place of being a nuisance, the cars fitted with the appliances can be utilized in coupling cars with which they connect. For instance, here is a train of fifty cars to couple, and every alternate car is provided with one of the devices in question: The whole train could be coupled by using the apparatus as easily as if every car was fitted with it. A company ordering new cars from custom shops, or building their own, can have the devices applied at a merely nominal expense, and when cars are undergoing repairs they can be applied with no trouble worth mentioning; and in this way all the cars in the country would be equipped with one of the best known coupling devices, at a cost but little if any in excess of what is annually paid for killing and injuring employés engaged in coupling.

It will be seen that there is a vast difference in the expense of equipping a road with the expensive automatic arrangements and these economical contrivances, to say nothing of the trouble attending the application of the

former, and the ease and comfort with which the latter can be applied; not forgetting that they will be regarded as welcome visitors on foreign roads, instead of nuisances, as is the case with the "automatics." This matter is worthy of the attention of every railway official in the country.

RECIPROCAL DUTIES OF RAILWAYS TO THEIR EMPLOYES.

BY ROBERT M. COOPER.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT is safe to assume that a railway employé who is content to perform his allotted duties in a mechanical manner and with a sort of half-hearted correctness will not rise very high in the world, nor experience any rapid advancement at the hands of his employers. It is likewise safe to assume that a railway company which simply pays its employés their wages and takes no further interest in their welfare, can hardly expect a very intelligent and zealous set of hands. There are reciprocal duties on the part of both the employers and the employed, and a proper regard paid to the interests of one by the other is invariably followed with increased prosperity to both. If for no other reason the performance of these reciprocal duties will prove a paying speculation.

It is a first and absolute requisite that the railway employé shall bring with him a high degree of natural intelligence, together with a thorough understanding of the duties to which he is allotted, and from an educational point of view he is grounded. However he may develop after his relations with the company have commenced, he is primarily the active force which produces the development; but unassisted he can do little, and unencouraged he can do positively nothing. It is the duty of the company to foster whatever latent energies he may possess and to develop his particular bent if he have any. Mechanical genius should not be tied down to dull routine work to an extent that will smother a desire to improve the methods employed, but taught to understand that the beneficial exercise of inventive gifts will not be unrewarded. No matter how humble may be the tasks allotted to an employé, nor how simple their nature, nor how meager his remuneration, the man should be allowed to see a ladder before him on which he may climb if he has the skill to make his opportunity and the pluck to grasp it. I would not give a copper for a precise reliable animated machine who does as he is told and never has a desire to do what he is not told in the hope of finding a better way of doing the same thing; and did circumstances compel me to accept a position upon a railway where I was told to do certain things in certain hours and always do them in certain ways, the exercise of the powers of invention being positively forbidden, I would eagerly seek for another situation. It costs a railway nothing to exert an educating influence over their employés, and the returns for this slight manifestation of interest in their behalf are ample.

It is cheerful to note the numerous libraries which the railway employés possess throughout the country, and equally gratifying to observe that the companies are taking a lively interest in their maintenance. In the promotion of these institutions much good may be accomplished, and in time it is to be hoped that they will go further than to furnish reading matter merely. The inducements for a hard-working man to spend his leisure hours in solitary reading are not great, and he naturally seeks a recreation which he may enjoy with others. The library as a library is a good thing, but far more good could be accomplished if, instead of mere reading rooms, the institutions were made lyceums in which talent was employed not merely to instruct but to interest as well. A series of lectures to railway employés would or could, I fancy, embrace a number of topics that could not fail to awaken interest and stimulate their energies toward improving their minds, and as an infallible consequence furthering their employers' interests. Train-hands especially, whose duties at best are rather dull, could be awakened to take pleasure in their labors by the development of their capabilities to act in the numerous emergencies which they are in constant likelihood of meeting, and also to take a lively interest in devising new methods for doing old tasks. It has frequently occurred to me for instance, that to no class of persons could the information be conveyed of the knowledge furnished by the lectures on "first aid to the injured" with more positive and beneficial results to the public at large than to train-hands in every capacity. Not a day passes that some one does not meet with injury on the thousands of miles of railway in our country, and frequently accidents occur far off from surgical assistance. Numerous lives could have been saved in times past had the train-hands at the time of accident possessed the knowledge of a few simple rules that would enable them to act intelligently and correctly in caring for the injured persons. Possibly the railway companies have already introduced instruction of this nature and if they have, it is a praiseworthy action on their part, as well as a duty they owe to both their patrons and their employés, unless they are prepared to furnish surgeons with every train after the manner of ocean steamships.

In spurring the natural desire for improved methods that is common to all men, railway companies can accomplish much. It is one thing for them to say: "This thing is to be done and it is to be done this way; you can hardly expect to suggest a better way." Doubtless the work will be well done but it will not be intelligently done; the railway will furnish the brains and the employé the hands. Better is it to say: "This work must be done, and we have always done it in this way. If you can suggest a better way your skill and inventive genius will be rewarded." I notice that a contributor to the JOURNAL for June says that British railway train-hands are more reliable as a rule than American though not so intelligent, and doubtless this is true; yet while reliability in employés is an admirable trait and indispensable to train-hands, too often is it obtained at the sacrifice of every natural desire and impulse to branch out and do a little original thinking. The American mind is, I think, naturally progressive. It matters little what station in life and what occupation a native American may fill; by heritage he is given an active mind and his capabilities should be given a fair chance. Possibly and even probably he may accomplish little in the way of practical results, but an entire subjection of his individuality to his wage-work will injure the former without benefiting the latter. By all means let railways give their employés a chance, if not to distinguish themselves at least to try, and this trial will test the value of

each man's services and ultimately relegate each to the position he is best qualified to fill. Let the companies demand reliability as the first requisite on the part of their employés, but let it be intelligent reliability and not the dull, unvarying accuracy of a machine.

Regarding the interest which railways should manifest in the morals of their employés there need be but little said, for self-interest alone is sufficient to prompt such action. It is absolutely necessary that their employés should be honest and steady, and for this reason the railways are forced to exert an influence which if not moral can at least be deemed admonitory. As far as exerting religious influence is concerned, the less they have to do in that direction the better, for from a strict biblical point of view railways are not shining exemplars and precept without example is not strikingly effective. Those few roads who abstain from running Sunday trains might with propriety look after the spiritual welfare of their employés but the vast majority of roads do run Sunday trains, and such a supervisory action would be a little inconsistent. It is to a mental and social influence that the railways should aspire and in exerting it they would find enough beneficent work on their hands without venturing in other fields.

Thus much for the railways' share of the reciprocal duties. They are not difficult of performance, nor would the experiment be costly, and I feel convinced that from a selfish standpoint, if from no other, the venture would be found to pay. But if the employers owe this attention and assistance to their employés the latter are not without obligations that are similar in the fact they are not called for in the bond. An employé is hired for certain definite duties and with their performance he too often ceases to exert himself. There is no feeling on his part that he owes an allegiance to the road which gives him a living, and he is generally inclined to regard his employers as natural enemies who await and seize every opportunity to harass and oppress him. As a natural result there is apt to be a mutual feeling of distrust between the two which manifests itself in strikes and uncalled-for disagreements between them. For my part I could never see the sense of this position which workmen are prone to take toward their employers. After family and national pride and fealty, it seems reasonable that loyalty to one's source of living comes as a natural sequence, but facts do not bear out the assertion. Capital and labor have for years been arrayed against each other and as usual in all unfriendly contests there is wrong on both sides. Railways doubtless employ as many if not more hands than any other industry if we take all the ramifications of the railway business into consideration, and for this reason this opposition is more manifest with railways than in other industries, for I do not think the railway employé is more unreasonable or contumacious than any other; but there is rarely an occasion when a little forbearance on both sides would not avert an open conflict. Fidelity on the part of a railway employé to the interest of his employers does not confine itself to attention to duty. It goes further than this and demands that no opportunity should be neglected by the employé to benefit his road, either by imparting desired information, by the rigid practice of economy when using railway materials, or by application to discover improved methods that will simplify the details of railway traffic. As I have said before the railways themselves are not given to encouraging originality or its development among its employés, but it should nevertheless be practiced until it demands recognition, and before arraying themselves against their roads, employés should not consider the extent of concession that the railways might be compelled to grant but rather the extent which they themselves are justified in demanding.

I live in hopes of seeing a glorious unanimity of spirit among railways and their employés, and a constant growth of intelligence among the latter. Just how this revolution is to begin is an open question, but if both the railways and the employés should each make up their minds that it is their place to make the first move it would be a wonderfully quick revolution. This much can be said with regard to the initial step: That the railways hold the key to the situation and there would be no room for the suggestion that their action toward the desired end was a deep-laid plan to ensnare their unwary employés.

LUBRICATING AND LUBRICANTS.

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

VI.

ADAPTATIONS OF LUBRICANTS.

MANY intelligent and practical machinists cling to the old idea that one kind of oil should answer all the purposes in their shop, and hold to the use of lard oil exclusively. Lard oil is an excellent oil when of the best quality and pure; it is, however, very difficult at the present day to secure pure lard oil, as it is often manufactured of the vilest material and adulterated in endless proportions with cotton-seed oil, white and inodorous and much cheaper than the commonest grades of lard oil. It is also adulterated with so called mineral sperm oil which perverted ingenuity successfully and expressly manufactures for adulteration so perfect, that the uninformed are unable to notice its presence in the adulterated oils. There are also an endless number of mixtures of the lower grades of lard oil with all kinds of mineral oil for adulteration, and the less lard oil there is used in such mixtures the viler is the quality used to secure by its prominent odor a more ready sale for it. Cotton-seed oil is a very useful oil, but it belongs to the class of "drying oils," and like all of them is an inferior lubricant.

All the fatty oils decompose readily and leave gummy deposits which, with the dust in the shops and the abrasions from the metal, encumber the bearings and finally injure the machinery. Machinists are well aware of the inconvenience caused from the gumming of such oils on machinery not in constant use, and when hurriedly in need of using such, for instance a planer, are often delayed by the necessity of first cleaning and getting it into working order. There is a sufficient market for all animal and vegetable oils and all grades of mineral oils, and they should be employed for lubricating purposes only in accordance with their adaptations for that purpose. It is erroneous to expect one kind of oil, however good, to serve thoroughly and economically for all the manifold requirements in a factory or shop, and it needs not much observation to understand the fallacy of such a course.

Lubricating a cylinder and valves means lubricating in the presence of heat and moisture, and the lubricant, to be effective, should have greater consistency than a lubricant applied to machinery at ordinary temperature; and lighter machinery in rapid motion requires a more limpid and penetrating but, at the same time, tenacious lubricant than is needed for machinery of heavier weight and slow motion. Again, an oil used for lubricating running machinery effectually cannot be expected to do efficient duty for screw or thread cutting, drilling, etc., as the requirements in each case are widely different. The heating of bolts, pipes or screws and their dies, emanating from the frictional motion, is not so continuous as in the case of running machinery where the lubricants have to absorb and rapidly eradiate the heat evolved. In screw cutting, etc., the metallic surfaces are of very different density; their contact with each other is limited and constantly changed for new cool metal, so that ample time is afforded for the complete eradiation of the frictional heat and hence the heavy glutinous animal oils, with their superior heat-absorbing, but slow heat-eradiating power, are more efficient than the mineral oils which eradiate heat faster than any amount of glutinous or resinous matter mixed with them seems able to absorb. The watery preparations and emulsions intended to extend and lignify the lubricant for cutting small screws with rapid motion, stand in the same relation to the heavy oil used for cutting pipes and bolts, as the more liquid lubricant needed for lighter and fast running machinery to the heavy oils used to lubricate cylinders and heavy bearings; and neither is able to fulfill the duties of the other effectually and profitably.

It pays to use a good efficient oil expressly and intelligently manufactured for the lubricating of machinery and which can be obtained at less cost than reasonably good lard oil; and to keep separately for drilling and cutting purposes, a supply of some cheap quality of fatty oil. The economy and benefit from following such a course will soon outweigh the little inconvenience arising from keeping and using more than one kind of oil around the shop. Oils of tenacious lubricating power but of the greatest fluidity should be used on light and fast-running machinery; on engines and machinery with slower motion oils of greater consistency are necessary, and oils of still greater consistency should be used for lubricating cylinders and ponderous machinery, and heavy bearings.

All experienced mechanics and managers are well aware of these facts, and well know the advantage of using oils properly qualified to lubricate the different kinds of machinery.

(To be continued.)

FUTURE RAILWAY EARNINGS.

[From the *Railway Review.*]

THE present year has been a period of great uncertainty in railroad affairs, the earnings on many lines showing a large diminution as compared with last year's figures. The result of this reduction in revenue which has amounted generally to a larger percentage of the total amount than holds with any reduction of expenses, has been that a number of leading lines have been seriously crippled. Such have in some cases not only been obliged to pass their interest obligations, but have also failed in meeting their bills for supplies and amounts due for work performed by the employés. The consequence is that a new era of railway receiverships has set in, and while the list of roads thus taken out of the hands of their stockholders has not reached as high a number as in the years following 1873, yet the number is large enough to show that the condition of unremunerative operation is widespread. We do not pretend to deny the fact that the methods used in the construction of some roads have been such that the load of fixed expenses to be regularly met has reached such a volume that only the results of the most prosperous years would furnish revenue enough to meet them. In fact the disposition to discount the future has been too great on many lines, and one or two prosperous years are used as a basis for branching out in different directions and in ways that largely increase the regular expense to be met. Duller times following, find matters running upon a broad-gauge basis which cannot be immediately changed, and constriction and often disaster is the result.

Again, there may have been to a certain degree, extravagance in the management, thus using up the money which should have gone otherwise towards paying the regular fixed expenses. This condition of affairs we may consider as very seldom existing, and we may assume that the methods in use on all the leading lines to promote economy of operation, are up to the average of what is known of the art. The present condition of matters showing largely decreased revenues without equally decreased expenses, it is evident therefore that the net earnings, or the difference between what is gained for doing the business and the cost of doing the same, gradually becomes a smaller and smaller quantity. Upon this net revenue the whole strength and permanence of the railway system depends. The question, therefore, is how to prevent its further diminution.

This result may evidently be reached in two ways, for we may keep prices received for transportation fully up to their present rates, or we may, by greater economies and improved appliances, decrease the cost of doing the business, thus accomplishing the same result as regards net earnings. In general terms there does not seem any probability that the average rates for railway transportation will average higher in future years; and in fact the bulk of evidence points to gradually lowering rates hereafter, as has been the general rule for some years past. To this result everything in the railroad world tends. The increasing competition between the various roads themselves results in a constant movement in this direction and this natural reduction as it may be termed goes on in face of any attempts to reduce the loss by means of traffic agreements or pools. When we consider, also, the constant pressure brought to bear through the press, through public agitation, and through the oft repeated attempts at state and national legislation, it will be easy to see that if average railway rates even hold their own in the future they will be doing well. This being the state of affairs we can readily perceive that any future improvement is to come largely from reductions in operating expenses, and through constant aiming to make the cost of carrying freight or passengers decrease as far as possible in company with the gradual decline in earnings to which we have alluded before.

In this connection, therefore, it is well to examine into

the different classes of railway operation and analyze the component parts of each, seeing if possible when and where the same can be reduced. The main groups under which railway operating accounts are now generally divided may be stated as follows: Conducting Transportation; Maintenance of Way; Maintenance of Rolling Stock; General Expenses. Differences may occur on different roads as to the sub-accounts coming under each general heading, but the individual accounts we propose to examine are common to all roads, though under slightly varying names, and the results arrived at will be equally applicable to all.

Under the heading, conducting transportation, we find that one of the most important headings is train service. This includes the wages of all train-men with oil and supplies, as also the labor and expenses of cleaning out cars. In this account the chance of making material reductions seems quite small. Wages of train-men with other employés had a number of years ago reached their lowest notch, and prices at date are comparatively higher. The matter of increasing the length of trains beyond their present length would result in the employment of extra brakemen in order to control the train, and this would probably hold true even in case of the application of continuous brakes to freight trains. Material used for oiling cars and in operating trains probably cannot be reduced except by watchfulness in use. In wages of engine-men, it is probable that prices will never be materially lower than present figures, nor the number of men required to do a certain amount of work reduced. In materials used on the engines, such as fuel, oil and stores, there is yet room for improvement. In fact, in the fuel item seems to be the chance for the one largest single reduction that can be made. Comparisons for the last ten years go to show that the gain which has been made in the amount of load handled by one ton of coal is not in keeping with the saving in other items of expense. While better methods of using may be adopted, constant care and watchfulness will make the greatest saving.

In station expenses, but little can be gained at the ordinary stations, either in labor or material, except through detailed watching of individual expenses. At the larger and terminal stations we can probably reduce the cost of handling by improved methods of arrangement of depots, tracks and turn-tables, and the increased use of cranes and hoists.

The expense of traveling agents, solicitors and other foreign agencies come under the heading of conducting transportation, and though the complex nature of the traffic on our large lines will probably always render it necessary to spend money in this direction, the expenses should be kept within bounds so as to be in some degree commensurate with the amount of business that such men obtain. In the item of telegraphing it is probable that no vital reduction can be made as far as regards the movement of trains, for improved methods of moving and signalling, while perhaps making a saving through increased safety, will undoubtedly cost more to operate, thus partly balancing any gain elsewhere. The water system of our roads seems to be all that can be desired, the one chance of improvement being, perhaps, better methods of rendering the supply pure for locomotive use.

Under the heading, maintenance of rolling stock, we find the items of expense incurred in keeping engines, cars and machinery in good condition and up to the requirements of the road and the models of modern practice. One needed advance has lately been made in arranging for heavier car-loads so that there will be less dead weight to the ton of paying weight. There are doubtless improvements yet to be made in the working of steam in locomotives, as the present high-pressure system with the link motion seems nearly to have reached its highest development. The improvement of engine construction may be considered the second item in which a marked saving is possible. In repairs of engines and cars, improvments are being made from time to time, especially as regards the arrangement of shops and machinery. In car construction a saving is probably in the future from the further advance of the substitution of steel and iron for wood.

Maintenance of way comprises a large proportion of the total operating expenses. Here, though there is a gradual improvement in methods and in the substitution of more suitable materials than those which have been used, the total percentage of reduction to be made in the future will not probably be large. There are several items in which additional expense has to be incurred as a road grows, such as larger and more expensive buildings, more complex yard facilities and other matters which offset to a certain degree the savings made elsewhere. In general expenses there is probably no improvement to be made when compared with roads that are now economically managed. In fact it may be economy to increase the total amount spent under this head by employing such clerical force that the full details of the business, both of revenue and expense, may be fully understood by the management, thus giving a chance for comparison and improvement. In general terms it may be considered that of the whole operating expenses of an ordinary first-class line only twenty per cent. will cover those items in which there seem any prospect of a radical change for the better. In the remaining eighty per cent. there seems only room for such saving as careful and watchful management can control by cutting off unnecessary expenses. This possible reduction on any of our best managed lines is small. That comparatively little improvement has been made for the last few years will, we think, be shown from the fact that railway expenses as a general rule were higher in 1883 than in 1880, for doing a certain amount of work. This fact, together with that of a constant decrease in revenue for carrying the same amount of goods will doubtless emphasize the necessity of the closest and most economical management as the only chance for legitimate profit from railway property in the future.

SECOND-CLASS CARS.

[From the *National Car-Builder*.]

IT is a question whether railroad managers in this country will not before many years be forced to consider the expediency of providing second-class cars for all passenger trains upon roads where the passenger traffic is at all heavy. The cars that compose these trains are public conveyances, and all sorts of people want to ride in them. It is for the interest of railroad companies to carry as many passengers as possible at rates that will afford a profit, and it is for the interest of the public to have the

rates as low as possible, and the profit derived therefrom distributed so that each class shall pay its fair and equitable share of it and no more. No matter how much we may ignore, theoretically or politically, the existence of class distinctions as something foreign to our system of government, they do exist nevertheless as rigorously and as unavoidably here as anywhere else, and in the relations of business they have got to be dealt with as such. Hitherto in our railroad practice these distinctions have been disregarded, there being no second or third class cars on our roads, in the meaning of these designations as applied to cars on European roads. Parlor and sleeping cars with us are special accommodations peculiarly American. Emigrant cars are for emigrants, and not for the great mass of people who would like to travel at less than the regular uniform rates, even if the cars were a little less luxurious and stylish. It may be said, then, that all passenger cars in our trains other than parlor and sleeping cars are first-class, and that every body who rides in them on purchased tickets is presumed to pay regular fare, or what would be first-class fare if there were any second-class. In view of this surface condition of things, it would be interesting to know just to what extent second-class tickets at reduced rates are sold over through routes, the buyers of them having free access to all the cars of a train except parlor and sleeping cars, and mixing themselves up among the mass of passengers who have paid the regular and higher fares. That a great deal of this kind of thing is done there can hardly be any doubt. That it is likely to increase seems highly probable, and the question is, how long and to what extent can this discrimination be practiced before it will culminate in the introduction of second-class cars in accordance with the system which prevails so extensively in Europe.

The official return of passenger traffic on thirteen leading English roads for the last half of 1883 showed that eighty-seven per cent. of the whole number of passengers carried was third-class, and that seventy-five per cent. of the revenue from passengers was derived from the same class. We notice also a recent statement covering four years of passenger traffic, ending in 1883, of the East Indian Railway, a line 1,500 miles long, showing a much larger preponderance of third-class passengers and revenue thence derived; but the character of the population in India, and the great difference in rates between first and third classes, are not a fair criterion, of course, for this country, or even for England; but the results are significant as to general conclusions. The steady growth of our manufacturing industries, especially at the South, together with the heavy emigration from abroad, are adding largely every year to the number of those who require second-class cars and cheaper fares, and if these are a necessity in Europe, as they certainly seem to be; if they are an indispensable convenience to the population there, and a prolific source of revenue to the roads, why should they not become so here under the same or similar conditions?

We do not wish to be understood as favoring the introduction of class cars so long as it is cheaper for the roads to carry all passengers in one class of cars, as they are now doing. We would only suggest whether the time is not coming when it will pay the roads to enable people to classify themselves to a greater extent than they can now, by providing a class of cars at lower rates. To have two kinds of cars in every train where there is now but one kind, exclusive of parlor and sleeping cars, would of course increase complication and cost, and unless the increase of earnings from second-class travel would more than cover the increased cost, the change would be of no advantage to the roads, whatever it might be to the public. Assuming, however, that second-class fares would cover the increased cost, it may be asked whether, with the increase of that class of our population who are not sensitive about traveling second-class, a state of things is to be continued always which throws people together promiscuously when they would prefer to sort themselves so far as they can do so on the basis of a difference in fares. Class cars and fares would not of course make everything congenial by separating the vulgar from the refined, or the unsavory from the clean, nor would the rooted prejudice against class distinction be at once overcome. Many people who for economy's sake would prefer to travel in second-class cars, would at first go in the first-class for the name of the thing, even if they traveled less in order to afford it. They would feel reluctant to make an exhibition of their poverty even to strangers, although their dress and baggage might indicate it almost as well as the getting in or out of a second-class car. But this sensitiveness would be felt less keenly by familiarity with the custom, and would finally be overcome and laughed at.

There is another branch of this subject that has already attracted some attention in Europe, and which is, that the carrying of first-class passengers at the existing rates brings little or no profit to the roads. If there is any profit from this source on European roads it is in the aggregate quite inconsiderable as compared with the profit derived from third-class passengers, the entire receipts from the first-class amounting to only a small percentage of the total receipts from the third-class. This confirms us in the opinion that if all the elements of expense that are involved in the running of parlor and sleeping cars in this country could be correctly ascertained, it would be found that travelers in these cars contribute much less to the profits of the railroad companies than the people who travel in ordinary coaches.

ELECTRICITY AS A MOTOR.

[From the New York *Sun*.]

THE interest aroused by the trial the other day of the Cleveland Electric Street Railroad, the first put into operation for city passenger travel in America, is natural, and the degree of success claimed for it is not surprising. Nearly a year ago electric cars were moved through the crowded thoroughfares of Paris by the Power Storage Company of that city at the rate of nine miles an hour on a level and of more than five on an ascent. A distance of thirty miles was accomplished by moving the car from one route to another in the French capital, often across several yards of trackless ground, and without accident or difficulty of any kind. The locomotion was effected by Faure-Sellon-Volckmar accumulators, fixed under the seats, and connected with a Siemens machine beneath the floor. Last November we had the less successful preliminary trials of the Daft motor on a Saratoga railroad.

The electric railway in Vienna dates back to the Electric Exhibition there, when a mile in three minutes was regularly made by the train. At Berlin the high level

railway was at the same time operated by electricity. The small electric railway at Portrush derived interest from seeking its energy in a neighboring waterfall; while the invention of Desprez for transporting electrical force to great distances has been applied to a waterfall near Grenoble, which has worked, to the extent of seven-horse power, a printing press, a sand mill, and other machinery.

An electrical omnibus, also, has been tried with success in Paris, during the busiest hours of the day, and the heavy vehicle was handled and turned with facility. In some of the coal mines of Saxony electricity has for many months been employed, not only to draw trains of coal, but also to work a ventilating fan. Even a thermo-electric stove has been invented, as have also electric lights that can be used on railway cars, in spite of the vibrations and frequent shocks to which trains are exposed.

On the water, electricity as a motor has made no less rapid progress than on land. Last summer an electric boat was plying on the Danube Canal, taking thirty or more passengers six miles an hour against the strong current and eighteen miles an hour with the stream. Two years ago a launch propelled by electricity was shown on the Thames, and the following year a boat of that character, forty feet long, attained a speed of eight miles an hour on the measured mile—this boat being the one, we believe, already spoken of as used on the Danube. Its trips were accomplished, of course, without smoke, or heat, or smell of oil, and also without noise of engines or vibration. As for the application of electricity to submarine torpedoes, it is now the subject of much study, attended with some success. Electric small arms have already been invented, and one such weapon was operated not long ago by Col. Fosbery at London, before an assembly of army officers and others, by means of a small accumulator secreted under his waistcoat. The gun was the invention of Pieper of Liege, who has fired more than a hundred rounds with it in two minutes. We may yet see electricity revolutionizing the manufacture of small arms.

But there is special interest attaching to the use of electricity in transportation, because here an enormous element in modern life, affecting great populations at all times, is dealt with. Of course the matter must still be viewed as experimental, since only protracted tests fully determine those considerations of economy, convenience, and safety on which ultimate success depends. It is certainly noteworthy, however, that while various new motors, such as caloric, compressed air, coiled springs, and grip cables, have been under contemplation and trial for so many years as possible substitutes for horses in street railways, electricity has suddenly come to the front, threatening to supersede them all.

Consumption of Railway Ties.

ACCORDING to a recent number of the *Wood-Worker*, there are now fully 148,000 miles of railroad track in the United States, and therefore about 391,000,000 ties, and the average consumption for renewals should be about 56,000,000, or the product of 560,000 acres of land, at 100 ties per acre, requiring 126,800,000 acres or 26,000 square miles, equal to less than half the area of Michigan or Wisconsin, two-thirds the area of Maine, and a little more than half the area of North Carolina, if, as reported, it takes thirty years to grow tie timber.

Mr. Hicks says that the reports to the Forestry Department show that it takes thirty years to grow timber large enough for ties, and that the product is about 100 ties per acre, while the average cost of ties to the railroads is thirty-five cents. This is a product worth $35, as the return of an acre for thirty years. If this is all, then with money at five per cent., no cost of cultivation and no taxes, it will pay to grow ties on land already wooded worth $8 per acre, and on land worth $7 per acre if interest is six per cent.

If 113.3 acres of woodland are required to maintain the ties of every mile of railroad, the question with the railroads, says the *Railroad Gazette*, is not simply whether they should produce their own ties, but also whether they may not profitably diminish their consumption. The experience of Germany indicates that an average life nearly three times as long can be had by preserving the ties with chloride of zinc, or creosoting (so called, for there is usually little or no creosote in the oil used). But even if the product of fifty-six acres per mile is required, it does not follow that the only escape from a famine will be the cultivation of timber. If land planted or stocked naturally with the trees which will make 100 ties in thirty years is worth $20 an acre—and in many parts of the country it is worth as much as that—at the end of thirty years required to grow the trees it will represent, with interest at six per cent., $118, and with interest at five per cent., $88; and if then the land after the ties are cut is still worth $20 an acre, the 100 ties, before cutting, will have cost $98 in the one case and $68 in the other. But the taxes meanwhile would probably have cost $50 or $60 more, and there would be some expenditure for care. If then the land is not cheaper than $20 per acre, the railroads will probably do better to depend upon some metallic substitute than to grow tie timber, even if it gets fourteen years' life out of a tie.

Royalty on English Railways.

THE Prince of Wales recently delivered an address before the Railway Guards' Universal Friendly Society, of London, in which he said:

"I find that there is no return given which will show the number of trains run in any one day by all the railway companies in the kingdom, but I have been able to ascertain one or two facts which may prove of interest. At Watford Junction, on the London and Northwestern Railway, 333 trains pass through that station every day. This gives something like one in every four minutes of the twenty-four hours. At Cannon Street Station on the Southeastern Line, the number of trains using the station is 750 in one day. I also find that at the Clapham Junction the London and Southwestern Railway had, in the year 1877, on an ordinary week-day, 656 trains; while on the Derby day of 1876 no less than 1,023 trains passed through this junction. These numbers do not include the trains of the London, Brighton and South Coast Railway, which also use the junction. The total number of passengers conveyed in 1883, exclusive of season ticket holders, was: First class, 36,387,877; second class, 66,096,784; third class, 581,233,476; total, 683,718,137; add season ticket holders, 180,000,000; total, 863,718,137. Of minerals there were conveyed 189,485,612 tons; of general merchandise, 76,897,356 tons; number of miles run by passenger trains,

139,545,464; number of miles run by goods and mineral trains, 129,351,774; total miles run, 268,897,238; miles of railways, 18,668; number of persons employed, 367,660. It is worthy of note that all the men employed on railways are amenable only to the general laws of the country, and that the marvelous discipline which exists among them is kept up without any special powers. In order to show the great progress that has been made toward the safe working of railways, I may mention the following figures, taken from the returns of the Board of Trade. Thirty-five years ago the ratio of passengers killed in the United Kingdom from causes beyond their own control was one in 4,782,000, while last year it was one in 61,810,000. In 1883 only eleven persons were killed from causes beyond their own control. This fact speaks in a most unmistakable manner of the admirable management now exercised in the working of railways, and is a strong confirmation of the saying that a railway train is the safest place in the world. As compared with this upward of 200 persons are annually killed in the streets of London. The Board of Trade returns show some curious statistics. In 1883 there were sixty-one suicides on the railways. Not a single passenger was killed from a cause beyond his own control in England. Two hundred and ninety-three persons were killed trespassing on the lines of railways, and, during 1883, 40 horses, 59 beasts and cows, 110 sheep, 4 donkeys and 1 deer were run over and killed."

A Trip on a Fast Locomotive.

HAVING occasion lately to pass over some branches of the Philadelphia and Reading Railroad, a permit to ride upon the locomotives gave me opportunity to observe some striking points as to their work and wear.

At Bound Brook the Philadelphia and Reading Railroad joins the Central of New Jersey, forming the Bound Brook line between Philadelphia and New York. South of that point Wootten locomotives are used on fast trains. North of it, standard Baldwins. The train leaving Philadelphia at 7.30 A. M., engine 364, makes the run to Jersey City in one hour and fifty minutes, schedule time, including some eight or ten stops and "slow-ups." A stretch of seventeen miles between Princeton Junction and Bound Brook, including two slow-ups and one stop, was run in exactly seventeen minutes. Of these seventeen miles, eleven in succession were run in nine minutes and ten seconds, being a rate of seventy-two miles per hour. And of these eleven, two successive miles were run in forty-seven seconds each, being a rate of 76.6 miles per hour. This was the regular daily run; we were not behind nor making up time.

Even at these high speeds the engine ran about as smoothly as a first-class car. I have many times experienced severer vertical and lateral oscillations in such a car on reputable roads at forty-five miles per hour. So smooth, indeed, was the run, that instead of any nervousness as to the safety of such speeds, the query constantly suggested was: Why may not a higher speed be obtained with entire safety? Or is there anything to prevent it but the problem of making the requisite steam?

In fact, safety at high speeds is aimed at in these engines, oddly enough, by placing the center of gravity very high—perilously high it at first appears; but when it is considered that the higher the inclination of the lines from the center to the rails, within the limit of safety from capsizing, the more lateral shocks will be eased by the springs, then it ceases to be a wonder that lateral oscillations are so little felt, for the reason that as sudden shocks they cease to exist. And take away the sudden heavy impact of the flange of the wheel laterally against the rail, and the danger of the wheel climbing the rail is taken away.

The firing and steaming of these engines is to be noted also, as they are the prime condition of the high speeds. The fire box is placed above the level of the top of the drivers, and extending out the full width of the engine, overhangs them. An immense grate surface is thus obtained. Water tubes traverse the mass of fuel fore and aft, promoting circulation. The crown-sheet is separated from the fire-box by a wall of fire-brick rising above the level of the fuel, and by a hot air or flame chamber between it and the fire-brick. The crown-sheet holds the largest number of the smallest brass tubes I ever saw in a locomotive boiler.

The force of the blast being expended through so broad an area of fuel, the velocity of the air current through it is reduced, and as a result, but very little cinder, and that the finest, is ever drawn through the tubes. True, a spark-arrester is placed in the smoke-box—to comply with the law—but it arrests nothing, for nothing coarse enough to be arrested by it passes through the tubes; in other words, the stuff is all burned up in the fire-box. The fact that these boilers are able to utilize what is known as "buckwheat" size coal, making steam very feebly with it, is a strong point in their favor.

Notwithstanding the rapid evaporation effected—as high as forty-seven gallons per minute—they are not flighty. In the entire run above referred to the gauge did not vary three pounds from 135, due in part, perhaps, to an occasional blow-off, while slowing in to the water-tank.

On the return from New York, I rode to Bound Brook on a Baldwin engine, No. 165, having a remarkable record, viz., that of having run 119,360 miles consecutively, without any general repairs, her weight not having once been lifted from her drivers in that period.—*Cor. Scientific American.*

A Long Railway Journey.

DR. DAVID GILL, the astronomer at the Cape of Good Hope, thus illustrates the distance from the earth to a fixed star, Centauri. "We are a commercial people; we like to make our estimates in pounds sterling. We shall suppose that some wealthy directors have failed in getting Parliamentary sanction to cut a sub-Atlantic tunnel to America, and so for want of some other outlet for their energy and capital they construct a railway to Centauri. We shall neglect for the present the engineering difficulties—a mere detail—and suppose them overcome and the railway open for traffic. We shall go further, and suppose that the directors have found the construction of such a railway to have been peculiarly easy, and that the proprietors of interstellar space had not been exorbitant in their terms for right of way. Therefore, with a view to encourage traffic, the directors had made the fares exceedingly moderate, viz., first-class at one penny per 100 miles. Desiring to take advantage of these facilities, an Ameri-

can gentleman by way of providing himself with small change for the journey, buys up the national debt of England and of a few other countries, and presenting himself at the booking-office, demands a first-class single to Centauri. For this he tenders in payment the scrip of the national debt of England, which just covers the cost of his ticket; but I should explain that at this time the national debt from little wars, coupled with some unremunerative government investments in landed property, had run up the national debt from 3,500 millions to 5,500 million dollars. Having taken his seat, it occurs to him to ask 'At what rate do you travel?' 'Sixty miles an hour, sir, including stoppages,' is the answer. 'Then when shall we reach Centauri?' 'In 48,663,000 years, sir.' 'Humph! rather a long journey.'"

The Longest Bridges in the World.

A LATE number of the *Moniteur Industrial* gives the following as a list of the twenty-six largest bridges in the world:

	Lineal feet.
Montreal Bridge over the St. Lawrence	8,791
Brooklyn, over the East River	5,989
Rapperswyl, Lake Zurich	5,333
Volga, over the Sysran, Russia	4,947
Moerdyck, Holland	4,927
Dnieper, near Jekaterinoslaw, Russia	4,213
Kiew, over the Dnieper	3,607
Barrage-bridge, delta of the Nile	3,353
Kronprinz Rudolph, over the Danube at Vienna	3,266
Dnieper, near Krementchoug, Russia	3,250
Bommel, over the Meuse, Holland	3,060
Two bridges of Rotterdam, over Meuse	2,833
Mississippi Bridge (?)	2,588
St. Louis, over the Mississippi	2,574
Saint Esprit, over the Rhone, France	2,460
Kiulinbourg, over the Rhine, Holland	2,347
Cincinnati, over the Ohio	2,233
Chaumont Viaduct, valley of the Suize, France	2,000
Menai, England	1,956
Cubzac, over the Dordogne	1,817
Varsovie, over the Vistula	1,693
Iron-bridge at Bordeaux, over the Garonne	1,667
Stone-bridge, at Bordeaux, over the Garonne	1,623
Beaucaire, over the Rhone	1,460
Tours, over the Loire	1,457
Alexandre, at St. Petersburg	1,350

Of the above, the sixth on the list has just been opened; the Rapperswyl bridge is merely a pile structure and is only thirteen feet wide; the Sysran bridge over the Volga, carries the Orenburg railway, and was only finished in 1880; it has thirteen spans, and is raised 131 feet above the level of the river; it cost 13,000,000 francs ($2,700,000).

The Moerdyck bridge carries the Anvers and Rotterdam railways over the Meuse, which is about 8,800 feet wide at this point, and has been reduced by dykes; it has fourteen spans of 328 feet each. It was commenced in 1868 and finished in 1871; it cost about 12,000,000 francs ($2,400,000).

The above list is given as printed, but the compiler in the *Moniteur* has in his table wholly ignored many of our long American bridges. A complete list of the length of modern iron bridges is not just now accessible, but among the omissions may be noted:

	Lineal feet.
The Baltimore and Ohio bridge, at Havre de Grace (being built)	6,000
Wooden bridge at Columbia, Pa	5,366
Louisville Railroad bridge, over the Ohio	5,218
Cincinnati Southern Railroad, over Ohio	3,950
Havre de Grace bridge, over Susquehanna	3,271
Dauphin bridge, over Susquehanna	3,590
Monongahela bridge, near Homestead	5,200
Plattsmouth bridge, over Missouri	3,000
Quincy bridge, over Mississippi	2,847
Omaha bridge, over Missouri	2,750
Keokuk, Iowa, over Mississippi	2,008
La Crosse bridge, over Mississippi	1,672
Booneville bridge, over Missouri	1,651

To the above many other long bridges could doubtless be added, were the data at hand. The longest bridge in the world was the late Tay bridge, which was 10,320 feet in length, and the Forth bridge now under construction is to be about 9,200 feet long. Although it does not strictly belong to the class in question, the New York elevated railroad is really a continuous iron truss bridge, and the aggregate length is thirty miles.—*Engineering News.*

Railway Receivers as Rate Destroyers.

ON what principle of law, equity or common sense is the receiver of a bankrupt railway justified in permitting the road to cut rates and engage in a rate-war with competing lines? The receiver is an officer of the court and in the eye of the law can do only what is ordered by the court. It is the court, therefore, which originates and controls the policy of the road and is responsible for its management. But what right has a court of equity to permit its representatives and servants to engage in a contest which almost always involves the violation of express agreements with other lines, and always lessens the net earnings of the property which is in the hands of the judge as a sacred trust? Is it not most unnatural—is it not monstrous that a court should permit such a policy to be carried out? The legal tribunal obtains control of the railway because it—the corporation—is weak. Its business has not been sufficient to enable it to meet its obligations. It has been defeated in its attempt to establish itself among its rivals and has been put into the hospital, wounded and sick. How can the court to which this damaged and failing property is committed be justified in permitting it to reach out from the safe covert of legal protection from creditors and work mischief to those whose competition it has been, of itself, unable to meet?

The usual reason given for rate wars is that they are entered into to secure some right or advantage in the future to which the road which begins the contest believes itself entitled. But a railway corporation which has become bankrupt and has fallen into the arms of the court has no future. Before it can again enjoy an independent life the property must almost invariably pass into the hands of another corporation, and become a new enterprise. But certainly the court has no right to work for the interests of this new company. It has no right to adopt a certain policy because it may be of advantage to the corporation which, at some time in the future, is to purchase and manage the property.

It is the duty of the court to make the property yield all that it possibly can to the creditors, and to satisfy their claims by foreclosure and sale as quickly as practicable. The operation of a bankrupt railway by the court is merely incident to its jurisdiction, and is justified only by the probable benefit which will result to the creditors therefrom and by the accommodation which the running of the road gives to the public. But to authorize a rate war is damaging to the interests of the creditors. It is injurious to the public also, because it is now admitted that steady, rather than excessively cheap, rates are most desirable.

Then, too, the court which permits the road in its control to reduce rates below a reasonably profitable standard is robbing the shareholders of the other lines which are affected by such reduction. It is helping competitive railways to become bankrupt and go into the hands of receivers. Surely it is not within the proper scope of a

court of justice thus to make business for itself in the future!

From every point of view it appears that for a court to permit the railway which it operates through a receiver to cut rates is altogether inexcusable. That the judge has authority to prevent such a course needs no argument. And to insist that the road for whose management he is responsible shall not be an element of disturbance and loss to other lines is the plain duty of every chancellor who is called upon to settle the affairs of a bankrupt railway corporation. That a railway which has been unable to stand alone should be permitted by a court of equity to become strong for mischief because it is weak in other respects is simply outrageous.—*Railway Age.*

Railway Progress in Russia.

RUSSIA has raised a loan of fifteen millions sterling for railway purposes. As far as can be ascertained this sum has already been half expended, and the other half is intended for carrying out long projected works, such as the extension towards Siberia by the Tumen line, the opening up of the Donety coal district, the Kresie wrought iron district, the Bashkunchasky salt district, etc. But, it is said, to put all the Russian railways now lingering for funds into a proper position would require, at least, another such loan. At the present time the whole length of railways open in Russia is 22,211 versts, and adding 1,107 versts in Finland, and 217 on the eastern side of the Caspian, there is thus only 23,535 versts, or 16,000 miles of railway in the vast Russian empire.

English Railway Rolling Stock.

ENGLISH railway rolling stock works are nearly all busy, and a large number of the orders are for iron framework for cars to be built abroad. A contract for 1,400 freight-cars for the Western Railway of Buenos Ayres, is just now being executed by Messrs. Brown, Marshall & Co., of Birmingham. The whole of the frames are of wrought iron. Half the number are covered freight-cars, and in these the frame-work is of angle and T iron of Staffordshire make. The firm is also executing another contract for South America for 230 covered freight-cars, the frames of which are likewise of iron. In their passenger-car department they have three other contracts on at present for cars with iron frames for shipment. This pattern of frame is becoming almost universally adopted for all foreign orders, and appears to be more suitable for hot climates than timber.

A Wonderful Underground Railway.

THE London Inner Circle Railroad is a marvellous feat of engineering skill. It runs throughout its entire distance under the busiest center of the largest city in the world, and the operations attending the excavation and construction have proceeded without serious injury to or interruption of business or traffic. Quicksands have had to be passed through, beds of old rivers spanned, lofty warehouses and massive buildings secured while their foundations have been undermined, and an intricate network of gas and water pipes sustained until supports had been applied to them from below. Added to this, the six main sewers had several times to be reconstructed. Day and night the work has been carried on for eighteen months, and now the engineers are able to announce that their tunnel is complete. The laying of the rails and the building of the stations are the only portion of the immense work that remains to be done, and in a very short time trains will be passing over the whole of this wonderful subterranean road.

Two Destructive Fires.

ON the night of Monday, Aug. 4th, there were two fires that in the aggregate caused a loss of nearly half a million dollars—the destruction of the Ferry House of the Pennsylvania Railroad at Jersey City and of the Baldwin Locomotive Works at Philadelphia. The latter loss will prove the more serious in its effects, since many valuable patterns were destroyed that will be very difficult to replace, together with much valuable machinery. The loss in each case is estimated from $250,000 upward.

Bog Peat as Fuel.

THE bog peat of Mexico is now being used on a considerable scale as fuel for locomotives, stationary engines, smelting purposes, smiths' fires, and household use. The peat is mixed with a proper proportion of bitumen, and is said not only to burn freely, and without smoke in much quantity, but to give a higher dynamic equivalent of heat than the same amount of wood.

THE expedition to Hudson's Straits, recently mentioned by telegraph, is not under British auspices, but has been undertaken by order of the Canadian Government to determine the feasibility of Hudson Bay navigation, upon the establishing of which fact depends the construction of a railway from Winnipeg to Hudson Bay. This railway is designed to transport the wheat of the Northwest, and, if Hudson Bay is navigable for a considerable portion of the year, it will shorten the line to Europe from the Northwest very materially. The British Government refused to assist in establishing observation stations in Hudson Bay.

CHINA has evidently taken a new departure, if the statement is correct that the Government has ordered a railway to be made from Pekin to Tien-Tsin. The decision marks a wonderful change of policy from that in favor not many years ago, when the Government bought the Woosung line in order to tear it up. When eighty miles of railway are made in China, it will hardly be long before there are 8,000.

GERMAN engineers are now engaged in removing the foundations of an old bridge built by Charlemagne in the eighth century. The wood of the piles, used in its construction, although nearly 1,100 years old, is so well preserved that it can still be used in building. The iron, which was riveted to the posts, can also be used, since it is covered only with a thin layer of rust.

A LAW passed by the New Jersey Legislature at its recent session authorizes the use of electric or pneumatic train signals of approved pattern in the place of the bell-cord, the use of which on all trains is now required by law.

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Principal Contents of this Number.

A FURTHER REMINDER.

THE railway world is furnished with papers devoted to the publication of railway news, and there are also periodicals maintaining the discussion of matters of railway construction, management and finance, while mechanical papers make a specialty of railway inventions and mechanics. The AMERICAN RAILROAD JOURNAL stands alone in being a monthly railway magazine and review containing original and selected articles on matters of contemporaneous interest to railway and tramway officials, managers, mechanics and employés generally; and as such it deserves the united support of all who deem such a publication desirable. We have received a number of letters expressing satisfaction with the subjects and treatment of the contributions which have lately appeared in the columns of the JOURNAL together with hopes that they will be continued; and once again we announce our intention to publish several original papers in every number so long as they meet with general favor. The invitation extended to our readers last month to contribute articles to our columns is cordially reiterated with the assurance that every accepted article will be liberally paid for upon publication.

AN IMPORTANT DECISION.

THE recent decision rendered in the Court of Common Pleas in this city by Judge VAN HOESEN, in the matter of CHAS. F. MATTLAGE against the New York Elevated Railway Company and the Manhattan Railway Company, possesses a more direct bearing upon the interests of the elevated roads than any that has yet come to our notice; and if his decision is sustained by the higher courts no end of litigation may ensue. The plaintiff in the case is the owner of a building on the Southwest corner of Greenwich and Warren streets, in which he conducts the business of a dealer in provisions. He applied to the court that the railway companies in question should be enjoined from maintaining a station at the junction of these two streets, and if this relief should be denied him, that he should be awarded compensation for the injuries which the continuance of the station has caused and will cause him. Judge VAN HOESEN has ruled squarely in his favor, judgment with costs being awarded the plaintiff; and while we are in no sympathy with the rabid and unreasonable attacks which railway corporations are compelled to resist in the courts, we are forced to regard Judge VAN HOESEN'S decision a strong one in which his position is borne out by the facts in the case.

Quoting that portion of the laws of 1867 which conferred the necessary rights upon the New York Elevated Railway Company to construct and operate their road, he showed that the company was only empowered to run

through certain designated streets, and that three commissioners were appointed who should have power to remove obstructions and designate the points at which staircases should be erected to give access to the elevated structure; but that the power to construct the road did not include the right to occupy the highways with stations, this being clearly shown in the clause which expressly provides that the company may "rent, purchase or acquire such buildings or parts of buildings as may be convenient for the stations or depots for public access to the railway." Thus, the Judge argues, the legislature did not contemplate the erection of the stations in their present form, nor does he see the necessity for such erection. Under these circumstances he decides the station in question to be at present maintained without the authority of law and therefore a purpresture, or encroachment.

To the granting of the injunction the defendants raised several objections which were overruled by the court. They claimed that while the plaintiff's chief cause for action lay in the fact that the elevated station obscured his light, he himself maintained a wooden awning over the sidewalk which caused the same result. The Judge ruled, and justly we think, that it is clear that by building a shelter from the sun a man does not deprive himself of his right to complain of an unlawful structure that darkens his windows, and that if a man fails to make full use at all times of the light that the sun would give him, he thereby does not place himself at the mercy of anyone who chooses to obscure his light. Another objection made by the defendants to the granting of the petition was that the light in question was reflected light and that the station did not directly obscure the plaintiff's windows. This point the Judge dismissed as technical and very properly ruled that the question at issue was whether the plaintiff was unlawfully deprived of light by the maintenance of the station regardless of the manner of the deprivation.

Upon reading the decision we are somewhat surprised that the matter has not been brought into litigation before, and are forced to admit that the elevated railways have received a very effective blow. Either there must have been considerable looseness in drawing up their charters in not providing for the vital question of stations, or the question was purposely left in abeyance with the understanding that the companies would buy or acquire property for their stations at points on their roads after the manner of surface roads. If this latter supposition be correct it is amazing that the stations should have been built without objection being raised; and if Judge VAN HOESEN'S view be sustained by the higher courts, the tardiness of the action will not prevent the elevated roads from being seriously involved with countless suits of the same nature. They might take time by the forelock and introduce a bill in the legislature that would relieve them from their present embarrassment, but they would be confronted with the unpleasant fact that no concession would in all probability be granted them without the coincident passage of another Five-Cent Fare bill, and thus they would be between two horns of a dilemma. That the stations of the elevated roads are far more convenient to the traveling public in their present situation than they would be were they placed in or on buildings in the middle of blocks, is unquestioned, and we should heartily regret their removal. That this removal would be strongly opposed by nine-tenths of the property owners whose property is situated adjacent to the present stations is equally probable, for the latter sensibly perceive that their business is aided by proximity to such important centers of travel; but this does not appear to us to mend matters when Judge VAN HOESEN'S decision is regarded in its full breadth and cogency. There is the law, and it has been interpreted as contrary to the maintenance of the present elevated railway stations. It is difficult to predict the course affairs will take relative to their removal, but doubtless the companies will not submit without a further struggle, and the progress of the case, if it be appealed, will be watched with absorbing interest.

FIRE-PROOF RAILWAY FERRY-HOUSES.

THE destruction by fire a few days since of the extensive ferry-house and railway buildings of the Pennsylvania Railroad at their eastern terminus in Jersey City is an instance of the flimsy construction which is common in such structures. In a few minutes after the fire first broke out the premises were wrapped in flames, and in an incredibly short time damage was created to the extent of from $250,000 to $350,000. The buildings were a mixture of old and new and while fairly creditable in appearance, were mere shells in which there were no precautions taken to insure safety in case of fire. As far as known the conflagration was caused by an explosion of gas, and it is stated that there had been an odor of escaping gas about the premises for several days, but there is no evidence to show that this fact was taken as a warning nor that special pains were taken to discover and remedy the leakage. The Pennsylvania road is not the only road possessing ferry-houses and adjoining buildings of the tinder-box construction, and it is noticeable that nearly all such buildings seem to present an appearance of instability and inflammability that naturally cause strangers to regard them as temporary structures. In fact the destroyed buildings of the Pennsylvania were among the best of their class and if they were so perilously fragile and destructible, what may be looked for in the others? Beginning at Communipaw and working up the North River on the Jersey shore, it will be seen that none of the railway

termini have stations and attendant ferry-houses that possess the slightest claims to be deemed fire-proof structures. The buildings of the New Jersey Central road at Communipaw are flimsy wooden sheds that in a strong wind would be consumed by fire in half an hour if the slightest headway were given, and but a few months ago they were perilously nigh burned by the destruction of the adjacent freight-sheds. The Pennsylvania buildings came next and were a considerable improvement, yet they are now a smouldering heap of ashes. The buildings of the Erie road, next above, at Pavonia, are comparatively new, having been rebuilt after the fire of 1873 which of course totally destroyed the former buildings, but the present structures are as usual of the flimsiest construction and would suffer total demolition if a fire should break out in a remote corner and gain a trifling headway before discovery. The ferry-house adjoining the terminus of the Delaware, Lackawanna and Western road, at Hoboken, is conspicuous for being the handsomest structure of the kind on the river-front, but it is built of light woods and decorated with ornamental wood-work in a manner that would insure its speedy conflagration should the slightest chance be presented, while the railway sheds in the rear are of the most barn-like and primitive construction. As the railway does not own the ferry there may be some excuse in this case for the temporary and cheaply constructed sheds, but there is fault somewhere.

Thus it will be seen that of the four main railway lines terminating at the Jersey shore immediately opposite New York City, not one possesses terminal buildings and ferry-houses that are not in constant peril of destruction by fire, and that two of the roads, the Erie and the Pennsylvania, have met with this misfortune within a dozen years while the New Jersey Central has narrowly escaped a similar catastrophe in the same period; yet there has been no improvement manifested in the character of the buildings with reference to their fire-proof construction. In the case of the Pennsylvania road the buildings were not insured, the company preferring to carry their own risks rather than obtain outside insurance, so that the loss is an individual loss with which the road is alone concerned; but the surrounding buildings have a direct interest in the stability of the extensive structures that the road has reared, and in rebuilding them we trust that improvements will be introduced tending to diminish the chances of a disastrous conflagration. The Pennsylvania has shown much energy in maintaining its traffic and running trains upon schedule time despite the destruction of the buildings necessary to a proper conduct of its business, and we are not surprised that this progressive road has determined to rebuild the burnt structures at once; but we hope that this statement does not mean that the new buildings will be duplicates of the old. It strikes us that durable buildings of iron with as little wood as possible in their construction are best suited for the purposes of railway sheds and ferry-houses, and doubtless the public would pardon a little delay on the part of the road if the intervening time be spent in the perfection of architectural plans for new structures that will combine comeliness and durability with fire-proof qualities, and thus establish a new era in buildings of the kind.

The Pennsylvania road has been foremost in nearly every beneficial innovation which the railway companies have introduced at their termini in or near this city, and it has frequently set examples that met with prompt adoption by other roads. The opportunity is now afforded the Pennsylvania once more to take the lead in constructing a fire-proof ferry-house with adjoining stations, and notwithstanding the laudable desire on the part of its managers to repair the damage caused as quickly as possible, we believe their good sense will prompt them at the same time to guard against like contingencies in the future by remedying the architectural defects which were primarily the cause of the recent disaster.

OCEAN RACING.

THE present year will be conspicuous in the annals of ocean navigation for the sharp rivalry manifested by the trans-Atlantic steamer lines for supremacy in the question of speed, and certain it is that the passages now made by new vessels of several of the companies are remarkable, and in strong contrast to those of a few years ago, when an eight days' passage was considered as quick time. This record has been steadily beaten and the time of passage diminished until the "crack" boats are expected to cross the Atlantic in considerably less than seven days. The Guion line was the first to equip vessels with especial reference to their speed, and its example was quickly followed by the Anchor and National lines, until finally the staid and conservative Cunard line abandoned its rather musty policy which had been maintained for many years and entered into the rivalry with astonishing vim. At present the champion boats are the *Alaska* of the Guion line, the *City of Rome* and the *Austral* of the Anchor, the *America* of the National, and the *Aurania* and *Oregon* of the Cunard; the latter vessel having been purchased from the Guion line after it had achieved the fastest record. All of these steamers are new and superbly appointed, being furnished with the latest approved devices for the comfort and convenience of passengers, and their speed-records are so slight in variation that it is difficult to pronounce judgment as to which is in reality the fastest boat. The best record may be beaten any day by any of the above-named vessels and in time we may confidently expect to see the time of passage cut down to a little over five days.

All this is very well and betokens a spirit of progressive-

ness among steamship managers that is commendable. Trans-Atlantic voyages are at best wearisome, and after the novelty has worn away, travelers invariably regard the week or more spent upon a steamer as a period of unavoidable annoyance. Any action tending to diminish the time of passage will be hailed with pleasure by ocean voyagers, and all lines will eventually be compelled to build their vessels with special reference to their swiftness. So far so good; no one will complain at the introduction of swift vessels any more than they would at the running of fast express trains, nor is there any greater danger in patronizing a swift than a slow vessel; but the steamer lines do not stop there. They are not content with building and equipping fast vessels, but these same vessels are pushed to the utmost extremity of their speed and subjected to a constant strain for a diminution of their record. Bad weather is no longer taken as an excuse for a slow passage and it is, or seems to be, tacitly understood that the crack boats are to be worked "for all they are worth" on every passage. Nor is this all. It is now clearly apparent that the departure of the vessels is so arranged that two or more of the crack boats sail simultaneously, thus not only bringing their capabilities into rivalry, but confining the rivalry to the identical passage. The trans-Atlantic course is now a huge race-track and the public is weekly edified with the results of a grand ocean heat. Ultimately we presume the book-makers and sporting men generally will seize upon this rivalry as a promising field for betting, and as we are now constantly informed of the sums won and lost on trials of horse-flesh, so will it be with regard to the competition of ocean steamers.

It is to this racing feature of trans-Atlantic steamer navigation that we take exception. We maintain that it is impossible for any vessels to sail at the same hour and traverse several thousand miles of distance, straining every energy to arrive first at the point of destination, and at the same time give a proper regard to safety. We maintain that while a quick passage is always desirable, the passengers are in no wise benefited by the fact that their vessel makes a quicker trip than the vessel of another line, and that in a voyage occupying seven or eight days on the average, the delay of an hour or two, or even of a day or two cannot be of much moment. Persons crossing the ocean do not figure so closely as to reckon upon a few hours, and they cannot be seriously inconvenienced should the trip be slightly longer in time than they expected. Unlike railway travel, ocean navigation cannot be guided by a time-schedule other than a broad and safe computation that the voyage will occupy from seven to ten days; and this fact makes a great difference when a comparison is instituted between the two methods of travel. A traveler on a railway may reasonably expect that a train will run on, or near, its schedule time, and he has a just cause of complaint if without accidents of any sort the train is late in its arrival; but he is guaranteed nothing in a trans-Atlantic voyage with regard to the length of time thereof, and the hour of arrival in port. The one great claim a passenger holds upon the management of the vessel is that every regard shall be paid to safety, and that every other consideration shall give way before this. It is well enough to say that ocean navigation is as safe as railway travel, but the assertion, like many other assertions that have gained credence, is untrue. While the chances of accident to an ocean steamer are possibly no greater than to a railway train the results of accidents are infinitely more disastrous. In the one case the catastrophe is measured by the accident itself—the passengers of a railway train that are not killed or injured by the immediate accident are in no further danger; in the other case the loss of life is contemplated in a dozen ways after the steamer has met with injury. There is the horrible fear of the vessel sinking instantly and carrying its human freight to an ocean tomb; there is the prospect of a perilous voyage in an open boat, scantily provisioned and crowded to its gunwale with terrified human beings whose presence is an additional danger. Death by drowning, starvation, thirst, and even by violence are among the contemplated possibilities of an accident to an ocean steamer. Railway companies have almost universally prohibited the racing of trains upon their lines, and there is scarcely an occasion where it is practised that the public voice has not been vigorous in condemnation; yet in sober truth there is no more danger in the racing of trains than in the racing of ocean steamers, and a catastrophe happening to the latter is almost certain to be followed by a greater loss of life. Why is it that the railways are forbidden to carry on a practice that is commonly indulged in by ocean steamers, and even encouraged by their patrons? Surely there can be no just foundation for this discrimination.

How great, then, is the responsibility resting upon the steamship lines, and how great is the folly, not to say crime, of which they are guilty in every trial of speed which may involve the destruction of hundreds of lives. That this reckless spirit of rivalry will be abated is not likely until some fearful calamity results, and even then the reform will be but temporary, for steamship lines rejoice in one immunity that railway companies do not possess. In a railway accident, no matter from what cause, the company must look for a suit for damages, while the cases are rare when attempts have been made to mulct a steamship line for damages, no matter how criminal the negligence which brought about the accident. Alas! no. The traveling public have but one course to take in order to express their disapproval of ocean racing and to pay due regard to their own safety, and that is by avoiding the crack boats that sail at hours identical with the time of departure of rival vessels, thus appealing to the lines in the most direct and telling channel—through their pock-

ets. If ocean racing is not encouraged by the traveling public, the swift vessels, which are in themselves commendable, will be sensibly handled and conduce to the convenience of their passengers instead of the glorification of their owners and masters.

EDITORIAL NOTES.

A CIRCULAR received from a Wall street firm demonstrates conclusively that the recent panic is over and bears out the assertion made in the June JOURNAL that trade and commerce were not entangled in the meshes of the disturbance. On May 1st, before the panic, the average price of the thirty-two leading and active stocks was $68 per share, and during and immediately after the panic, they fell to an average of $49.52. They have now advanced to $65 per share or but $3 below the highest point in May. Come on with your panics! They don't scare us worth a cent and they serve the useful purpose of uncovering rascality and subjecting the market to a healthful and beneficial purging.

* * *

THE Hudson River Tunnel has superseded the Brooklyn Bridge as the languishing enterprise of the day. Work upon the Tunnel was discontinued some months ago, owing to a scarcity of funds, and it is now stated that the portion already constructed is filling up with water. We are somewhat in doubt as to whether the Tunnel would be of sufficient utility to warrant its completion, for as yet, the railways having termini with connecting ferries on the Jersey shore, have given no sign that the undertaking will receive their coöperation and support. For the use of our Jersey friends alone, without the patronage of through travel, the pecuniary success of the Tunnel would be extremely problematical.

* * *

IT is gratifying to note that the cholera is abating in the infected districts of France and that in all probability this country will be spared a visitation of the dread disease at least during the present year. None the less is it necessary to maintain a strict quarantine and carry out the projected work of cleansing and disinfecting our cities and putting them in a defensive condition. Experience has taught that epidemics generally appear on this continent the year following their appearance in Europe, and if we escape the cholera next year it will be a great triumph of sanitary skill.

* * *

AT last we have had an earthquake and a genuine one too. There was no mistaking the uncanny vibrations of Sunday, August 10th, and while such disturbances are novel we beg to be excused from participating in another, at least for some years to come. Unfortunately old Mother Nature is an exacting old lady and she may not see fit to accept our declination, in which case we will endeavor to put the best face on the matter and be on hand; while in the interim we will continue to publish the JOURNAL and enlighten the railway world.

* * *

THERE is at least one satisfactory feature in connection with the earthquake, which is that the railway and steamboat companies will not be able to advertise "Grand Earthquake Excursions," and that neither BARNUM nor FOREPAUGH nor their imitative rivals will be able to capture or purchase the earthquake and add it to their attractive monstrosities as the "Only Genuine Earthquake on Exhibition."

* * *

ON the whole these are pretty lively times. Within the past three months we have been visited by both a financial and a terrestrial earthquake, and there is the prospect of a political earthquake in November. The cholera scare has been a most active agent to keep our spirits up, and for once the crops have not been ruined by the drought, while to add to the burden of anxiety BEN BUTLER is running for President. Take it altogether, we are forced to conclude that 1884 will not be reckoned a dull year.

How to Deal with Mr. "Grabseat."

IT is a very safe plan on entering a car which has been half turned into a baggage car simply to request the bold solitary occupant of two or four places to remove the parcels from the seat you choose to indicate. It does not suffice to ask "Is this seat taken?" for the Grabseats do not hesitate to imply with a gesture that it is reserved. They mean that they have reserved it, but give you to infer that its occupant has just stepped out. An assured air is the only method of meeting this family on their own ground. You can suggest to the conductor, if he is in the neighborhood, that *he* remove such packages to the rack or the floor; and as you have paid for the seat you occupy, do not be cast down from your composure if, by coughs or a haughty air, your presence is signalled as unwelcome. Reserved seats for baggage or babies are not sold in an ordinary car, though the only way to discover this sometimes is to call on the passenger to show the number of tickets he holds for his barricaded seats. The conductor will do this, at your request, and then—and then only—does this most offensive family give any sign of confusion or humility. At all other times, by a magnificent bearing and a show of great annoyance when questioned, they appear to have chartered the car.—*Philadelphia Ledger.*

THERE is a strong feeling in various portions of the United States in favor of the total abolition of fences. It is stated that the cost of the maintenance of fences annually in this country is not far short of $80,000,000—a pretty snug sum if it might be saved to the farmers. It is estimated that there are 6,000,000 miles of fencing in all the country.

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

IS A SURFACE TRAMWAY ON BROADWAY DESIRABLE?

REGARDING the construction of a surface tramway upon the main thoroughfare of the largest city of the Western continent we have decided opinions, and these opinions are uncompromisingly against the advisability of the contemplated enterprise. Though devoted to the interests of tramway progress the JOURNAL endeavors to view things fairly, and did we own property on the intended route we should oppose the surface road with all the energy of which we are capable; no less should we oppose the scheme now, believing as we do that the road would be an unmitigated nuisance. The casual observer cannot fail to note the frequent jams and blockades which daily occur on Broadway, nor the difficulty with which vehicles are extricated and travel resumed. To drive from Union Square to Wall street requires no little skill on the part of the driver at all times, and the journey is a series of sinuous and tortuous twistings interspersed with some clever legerdemain by which a vehicle is forced through a passage narrower than its own track. Difficult as travel now is upon Broadway, conceive of what it would be were a surface tramway to be operated thereon. The presence of the rails themselves would be a most vexatious hindrance to travel, and the clever twisting and dodging which Broadway drivers are now enabled to practice through long experience would be rendered difficult if not impossible. The appearance of tram-cars would increase this difficulty to a wonderful extent and render Broadway well-nigh impassable. The solid and heavy car would be confined to its rails and in event of a blockade would be denied all lateral movement. No advantage could be taken of clear spots as is now the case with ordinary vehicles, and each succeeding car approaching in either direction would add to the confusion and involve the thoroughfare in an inextricable jam for many streets from the point of blockade. We are not aware of the speed contemplated by the Broadway surface road, but we should think a passenger very lucky if he could accomplish the journey from Fourteenth street to the Battery in a whole morning or afternoon. Just what interest the advocates of "rapid transit" can take in the proposed road we fail to see, for there is certainly no connection of ideas suggested, and the surface road would probably take pre-eminence as the slowest tramway in existence.

If anything could be more absurd than the contemplation of a successful surface tramway on Broadway it is in the discussion of the advisability of making it a cable road or employing an electric motor. While these two methods of tramway traction are in their infancy it is crazily proposed to adopt them on a road whose success under any circumstances is dubious, and whose operation under the primitive system of horse traction is overwhelmingly opposed for conspicuously good reasons. It is needless to say that the foregoing objections to a surface tramway on Broadway would be but intensified were new methods of traction adopted. A cable road would be positively dangerous and an electric motor probably most difficult to operate where instantaneous action is constantly required. On crowded thoroughfares traction itself must have intelligence, not only the person in charge thereof, and it is evident that horse traction will never be entirely superseded for this reason. Granting for an instant that full authority should be obtained to construct and operate a surface tramway on Broadway, it is inconceivable that permission should be given for the employment of any other motive power than horse traction.

But we fail to see why the construction of such a road should be allowed under any circumstances, and despite the assertion to the contrary, made by interested parties and prospective stockholders, we believe that a surface tramway on Broadway is neither a necessity nor a desideratum. On the thoroughfares lying East and West of Broadway at a distance of a block or two there are tramways without number, while the lines of three elevated roads are also but a short distance off. To crown all there are several efficient stage lines running on Broadway itself, providing comfortable stages at short intervals of time, and these stages are capable of greater speed and accommodation than a tramway could possibly offer. They can be guided with skill through narrow passages, can avoid obstacles, and in event of a prolonged blockade, can, by making a detour through a parallel thoroughfare, meet with little or no interruption in their regular trips. In bad weather they can take up and deposit passengers at the curbs and if properly constructed can ride easily without jolting their passengers. The precise advantages which a Broadway surface tramway would have over the Broadway stages we fail to note, but we do perceive a number of objections to the tramway from which the stages are free. In its proper place a tramway is one of the greatest conveniences with which cities may be blessed and far superior to a stage or omnibus; but most emphatically we should say that the most crowded street of the most crowded city in the country is not the proper place for it. Chimerical as the projects of constructing underground or elevated roads on Broadway may appear, the benefits these structures would offer are tangible, and should they be put in operation they would be of great

use and convenience; but a surface road on our proudest street would be an intolerable nuisance, conferring no benefits which the citizens do not enjoy at present, and an outrage upon the public at large and the owners of property along the route.

CABLE RAILROADS.

(Continued.)

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

AT the point where the cable is taken into the engine-house, it is passed down over a vertical sheave eight feet in diameter into a pit, and thence, at a right angle, under another sheave of the same diameter to a driving-drum at the rear of the engine-room or side furthest from the street. It passes a half-turn around this drum and is carried toward the street a short distance, and passing a half-turn around a sheave eight feet in diameter, it is carried back again to the driving-drum, and taking another half-turn, it is again led to the street, going around two sheaves to reach the tube in the same manner in which it was led from it into the engine-house.

Fig. 1 is a plan view in outline showing the sheaves for leading the cable from the tube to the engine-room which is below the level of the street. A A are the sheaves for deflecting the cable. B is the driving-drum and C the loose or idler sheave. It will be seen that the sheave C is inclined. This is for the purpose of conducting the cable as it comes off from one groove of the driving-drum to the other groove which is eight or ten inches away.

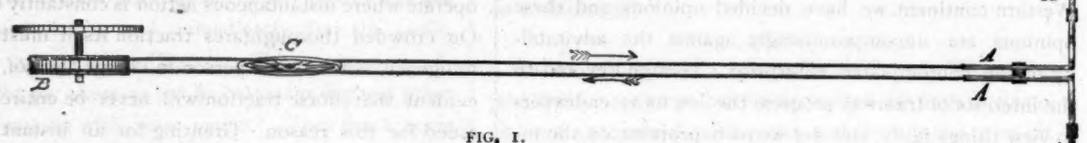


FIG. 1.

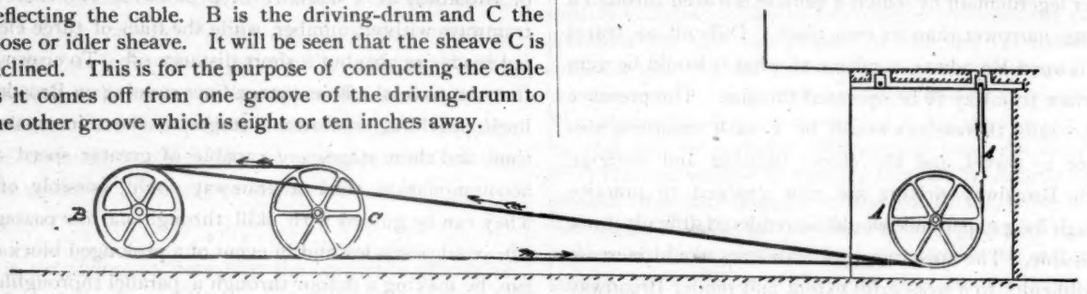


FIG. 2.

There is a distance of fifty or sixty feet between the sheaves A A and the drum B, and slides or ways are so placed that the sheave C may be moved close up to the drum B, or nearly to the sheaves A A, and securely fastened at any point. This is done so that any stretch in the cable which occurs may be taken up; and as the stretch usually amounts to one per cent. of the length of the cable, the distance required in this case would be one-half of 110 feet, or between fifty and sixty feet. When the cable is first put in the sheave C, the sheave will be close to the driving drum, but as the cable stretches it will be moved further away, until it reaches its limit or the cable is worn out. Fig. 2 is an elevation outline showing the direction of the running of the cable.

The driving-drum has clips around its circumference forming a groove into which the cable runs, similar to the well-known English Fowler's clip drum. Figs. 3 and 4 show the general construction. Around the periphery are cast grooves having stops at intervals, and into these grooves are placed the clips A A, the spaces between them being about equal to their width. These clips are so constructed that the cable in passing around the drum lies in the groove formed by them, and as the strain comes it tends to press them toward the center of the drum thus bringing the sides closer together and compressing the cable. This compression is sufficient to prevent the cable from slipping with any strain that is required in hauling the cars over the steepest grade in San Francisco. In this case the cable passes half way round the drum twice, equal to one full turn. These clips are so arranged as to be easily removed and replaced when worn. Any number of grooves may be made around the drum by extending the length or face.

The engines in use for driving the cable are known as the "Rider cut-off" and have cylinders fourteen inches in diameter by twenty-eight inches stroke. They make 120 revolutions per minute. There are two cylinders connected with a single shaft having a crank at each end. As one cylinder is sufficient to do the work, the other cylinder is disconnected and kept in reserve, the engines being usually run from six to ten months, alternately, unless circumstances require a change from one to the other at shorter intervals. Two boilers are used of the round tubular pattern, the shells being fifty inches diameter by sixteen feet long, and having fifty three-inch tubes. They are set up in brick-work so arranged that either or both can be used at one time. One boiler is sufficient and the other is kept in reserve, changes being made from one to the other every month unless sooner required by bad water or other conditions. As soon as a change is made from one to the other, the one which is relieved is immediately cleaned, and any needed repairs made and the boiler filled and placed ready for firing up at short notice.

As the cable runs six miles per hour, or 528 feet per minute, the drum which drives the cable, being eight feet in diameter, makes about twenty-one revolutions per minute, and as the engine makes one hundred and twenty revolutions, an intermediate shaft and spur gearing is used for reducing the speed from engine to drum.

When a cable is put in the tube for the first time, the

large reel on which the cable is wound when it comes from the factory, is placed at any convenient location near the tube, and a shaft is put through the center of the reel to serve as an axle. The reel is then set up in a frame so that it may revolve freely. The end of the cable is now taken from the reel and passed down through the slot or hatch into the tube, and has connected to it a thin bar of iron with an eye at each end. This bar of iron has one end passed up through the slot, and to this are hitched as many horses as may be necessary, and the bar with the

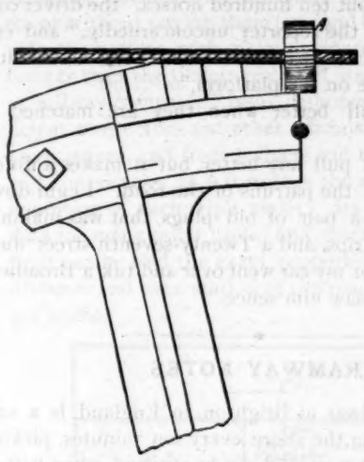


FIG. 3.

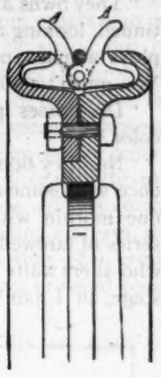


FIG. 4.

end of the cable attached is drawn to the terminus of the road, when the end of the cable is passed around the horizontal sheave. The horses being again attached, the cable is hauled to the other end of the road and is passed around the large sheave at that end to the place of starting. A sufficient quantity of the cable is then allowed for a splice and the balance cut off. Usually several hundred feet more are purchased than is actually necessary for the exact length, as the quantity left over is usually absorbed in repairs to the cable during its life. In taking the cable through the tube it is passed into the engine-house and around the drums during its journey, unless the starting point is at the engine-house and the ending at that point, in which case the drums in the engine-room are the last to be covered by the cable.

After the cable has been drawn around the road and cut, a stopper is put on near one end and all the slack is drawn in from the other, leaving a sufficient distance from each end to make a splice; after which the stoppers are taken off and the cable dropped into the tube through the slot which has been made wide enough by taking up the covering straps which adjust or regulate its width for a distance of say two hundred feet. When this cable becomes worn so that it has to be replaced by a new one, the old one is cut and the ends of the new are spliced to it, and it is drawn through by the engine, the old cable being wound upon an additional reel supplied for the purpose, cranks being attached to the axle and turned by hand as the new cable is slowly drawn in.

In addition to the sheave in the engine-house for taking up the stretch of the cable, this road has at each terminus means for the same end by placing the horizontal sheave upon a carriage having wheels to roll upon a track in line with the lines of track. This carriage is drawn backward by means of a weight attached to it by a chain passing over a fixed sheave, the weight having a vertical movement equal to the desired movement of the carriage which is about ten feet. These movements are automatic, and keep an equal tension on the cable at all times.

(To be continued.)

An Electric Tramway in Cleveland.

THE electric tramway in Cleveland, O., whose completion has been awaited with much interest, is now in operation, and its success is positive and gratifying. The road has been constructed under the supervision of the inventor, Mr. Walter H. Knight. A speed of fifteen miles per hour can be maintained, the current being generated by a Brush dynamo and supplied through electrical conductors placed in a channel between the tracks. The motor employed will be adopted by the East Cleveland Street Railway Company, and the ultimate success of electric tramways seems settled without dispute. The Cleveland *Herald* gives the following account of the opening of the road: "The experiment of running the car was a success, speaking in general terms, although the new and untried condition of things made several stops necessary, and the arm holding to its place the central brush that receives the electric current from the trough in the middle of the rails was too weak, and finally broke as the car was returning to the barn after having run up and down the track several times. Four miles from the barns from which the car started, a thirty horse-power dynamo-electric machine like that in the electric-light works was running. Over a No. 6 wire the electric current flowed to a pole opposite the barns, and it slid over wires heading down from this pole into a submerged trough between the rails. This trough extends the whole length of the Garden street extension, a mile long, and an aperture about an inch wide runs the length of the trough. Fastened to this trough by insulators on each side of the aperture are two iron bars, looking like miniature T railway rails. Over these flow the two currents of electricity. A broad iron reaching down through the aperture and projections on this iron, called brushes, fit into the space between these rails. These brushes catch up the electric fluid and transmit it up to the motor beneath the car. This motor is almost a miniature reproduction of the dynamo machine at the electric-light station. Every two horse-power of the dynamo machine at the station gives one horse-power on the road. Thus a power equal to fifteen horses was coursing through the submerged trough, and the inventors claimed that at least eight loaded cars could have been run over the line. The trouble has been with nearly all electric street railways heretofore that it has been possible to run not more than two cars at a time. The electric current having been brought up from the submerged rails, is transmitted to the motor by brushes on the bearings that give out bright green sparks of electricity, while the brushes running in the groove between the rails seem to shoot forth at times a reddish fire. The young man with the lever in hand pushed down the bearing brushes on which the electric current was waiting to jump to the motor. The connection with the car motor having been made, the armature began to revolve rapidly and turn the pulleys, over which ran a belting made of four-coil wires, which ran over a larger wheel and thence to the wheel inside the car-wheel proper and attached to the same axle.

Then the car moved off. It swept around the sharp curve with ease. It could, the inventors claim, be made to run at eight or even fifteen miles an hour—the ordinary street car does not exceed five. Lest small boys should stuff obstacles in the crevice between tracks, a steel sweep will be rigged in front of the brush that runs in the crevice. Ice and snow, being non-conductors, will not be a source of much trouble; but, while frozen water is a non-conductor, water in its normal state is a good conductor of electricity, and to carry it out of the trough, little catch-basins will be built at frequent intervals. 'The cost of fitting up this mile of track did not exceed $5,000,' said one of the syndicate of Cleveland and New York capitalists interested in the electric street railway venture. 'It would cost about $60,000 a mile to alter an ordinary street railway to a cable line.'"

A Cable Tramway in London.

A CABLE tramway is now in successful operation in London, on Highgate hill. The grade was too steep for horses, and its managers successively abandoned the projects of employing locomotives, compressed air and electric motors, determining to adopt a cable system. The steel wire rope used on the road—which is made endless by very careful splicing, extending over 40 feet, in order to secure a joint which shall not be larger than the uniform dimensions of the cable—is seven-eighths of an inch in diameter and composed of six crucible steel wire strands wound over a hemp core. The line is sinuous and irregular, and consequently it has exercised all the skill of the practical engineers to overcome the difficulties encountered in the best and most efficacious ways. It is about a mile in length, and the many curves vary in their radii from 3,000 to 500 feet, except at the points or switches, where the radius is 75 feet, and at the engine-house, where it is 60 feet. The gradients of the road vary from one in ten to one in seventy-five. The character of the road has necessitated frequent deflections of the cable, both vertical and horizontal. In many instances the permanent way does not occupy the center of the public road, but runs nearer to the east or the west curbs, the reasons for these deviations being the need to get the greatest lengths of radius for the various curves which the nature of the ground demanded. In its construction the cable road closely resembles the well-known cable road in Chicago, from which it has been copied.

The Broadway Surface Tramway.

THE Board of Aldermen of New York City, at a recent meeting, granted a franchise to the Broadway Surface Railroad Company by an almost unanimous vote, one Alderman only opposing the measure. The franchise is granted for no consideration whatever, and this action on the part of the Aldermen has provoked wide-spread indignation, it being claimed that $1,000,000 with five per cent. of the profits could easily have been obtained had the franchise been sold at public auction. Mayor Edson has been urged to veto the measure, but as yet he has not announced his intentions with regard to it. Should he approve it, the matter will doubtless be opposed in the courts. Many property owners along the proposed route are open and avowed enemies of the scheme.

Matched Car Horses.

A REPORTER of a New York paper boarded the front platform of a west side street-car, the motive power of which was a team of buckskin-colored horses with white manes and tails precisely alike. Coming down on the opposite track was a pair of dappled grays equally well matched. The driver stated in response to an inquiry that the company made it a point to match the horses in color as far as possible.

"They owns about ten hundred horses," the driver continued, looking at the reporter unconcernedly, "and employs a man specially to match 'em. He's an issthitic. You musn't smoke on the platform."

"Do horses pull better when they are matched in color?"

"No, they don't pull any better, but it makes a difference with some of the patruns of the road. I cum down one mornin' with a pair of old plugs that was makin' a series of farewell trips, and a Twenty-seventh street dude who allers waits for my car went over and tuk a Broadway stage, an' I hain't saw him sence."

TRAMWAY NOTES.

THE electric railway at Brighton, in England, is a success. It runs along the shore every ten minutes, picking up passengers as it goes, and can be stopped, when hailed, as easily as an omnibus. Its motion is sliding and pleasant while its capacity is apparently unlimited. It is to be extended to the western end of the Brighton beach, and is then expected to yield a very handsome revenue to its promoters.

MR. W. W. HANSCOM, whose series of contributions on "Cable Railroads" is now being published in the JOURNAL, was the engineer in charge of the construction of the cable tramway recently put into operation in London. It is a singular fact that none of the English papers have credited an American engineer with the performance of the engineering work.

ONE line of tramway in Brussels is to be equipped with electric motors which are to be used for one year, an accurate account of expenses being kept to determine the relative economy as compared with horses. Should the experiment be successful, all the lines in Brussels will be similarly equipped.

THE preliminary injunction recently granted restraining the Forty-second Street, Manhattanville and St. Nicholas Avenue Railroad Company of this city from laying their tracks through Forty-second street, has been dissolved by Judge Ingraham in the Superior Court.

THE Essex Passenger Railway Company of Newark, N. J., are constructing a tramway through the lower part of the city. It is to connect with the disused East Newark tramway, which is again to be operated, crossing the Passaic river at the Bridge street bridge.

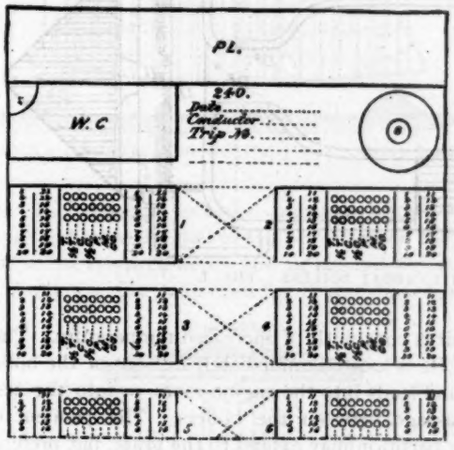
THE managers of the North London (Eng.) tramways have ordered fifteen small steam locomotives for use on their roads.

AN improved horseshoe is illustrated and described in the department of New Inventions of this number.

New Inventions.

Eldred's Check-list for Registering Railway Passengers.

SAMUEL D. ELDRED, of Minonk, Ill., has devised and patented a check-list for registering railway passengers, a section of which is herewith illustrated. This check-list is designed to protect the conductor from imposition by designing persons who ride short distances without tickets or without paying their fare, and from others who provide themselves with tickets, return or single, but ride further than the tickets read. It is also for the protection of railway companies from dishonest, careless and inefficient conductors and other officials, especially those who grant passes, and from scalpers and ticket-selling schemes and conspiracies, as it furnishes the auditor with the exact condition of each trip's traffic. Its use will also furnish data for many other useful and interesting features, since by it can be told the exact proportion that each section, division, and even station of the road pays toward passenger traffic.



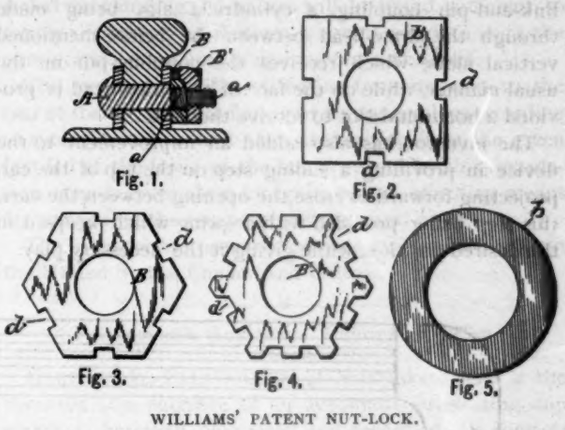
ELDRED'S CHECK-LIST FOR REGISTERING RAILWAY PASSENGERS.

The check-list furnishes the company an exact statement of each trip in concentrated form for preservation and reference. The list may be in the shape of a coach, as shown in accompanying cut, and is furnished with the station numbers on each seat, in two columns, one under heading "From," the other "To," and the conductor punches these as he finds them occupied. Each seat has also letters or characters designating the kind of fare taken as cash, half-cash, local, or half-ticket, coupon, mileage, or pass, etc. Duplicate "trip checks" may also be issued with stations thereon, folded so that both checks may be punched at once, and the company may require these to be accounted for in books of 100 statements, or thereabouts, which shall tally with the check-list each trip. Finally if they wish to put a "spotter" on the train occasionally, any one that can count will discover any irregularity; while in the present system the highest-priced experts often fail to find the leak.

It is the intention of the patentee to devote all the proceeds realized from his patent to the establishment of a home and labor school for friendless children.

Williams' Patent Nut-lock.

CHARLES A. WILLIAMS, of Lawsonham, Pa., is the inventor and patentee of a nut-lock, the peculiarity of which is the employment of a double-threaded bolt. In the accompanying illustrations, Fig. 1 is a sectional view of the nut-lock as applied to a rail-joint, and Figs. 2, 3, 4 and 5 show the parts in detail.



WILLIAMS' PATENT NUT-LOCK.

In Fig. 1, A is a bolt having a right-hand screw-thread *a*, and a left-hand screw-thread *a'* with an offset between them, one threaded portion being of greater diameter than the other. Use is next made of two nuts B B'—one, B (Figs. 2 and 3), which is intended to secure the bolt, screwing upon the right-hand threaded portion *a*, of the bolt A, against a washer *b* (Fig. 5), and the other B' (Fig. 4), which is designed for locking the bolt-securing nut, screwing upon the left-hand threaded portion *a'*, thus preventing the nut B from being jarred loose by the vibrations of a passing train or from any other source. To accomplish this result effectually it is also necessary to prevent the jarring and loosening of the locking-nut B', which is done by providing both nuts with peripheral notches *d* (Figs. 2, 3 and 4), the nuts being either four-sided or polygonal in form, and by bending any one or more of the tongues of the locking-nut B', into the corresponding notches of the bolt-securing nut B, the two nuts being thus firmly locked together, and incapable of being loosened by jarring from any source. The locking nut B' need be only thick enough to contain two or three threads, and the tongues need not be bent into the notches of the bolt-securing nut B, to a depth of more than one-sixteenth of an inch. The device may be locked and unlocked as often as desired.

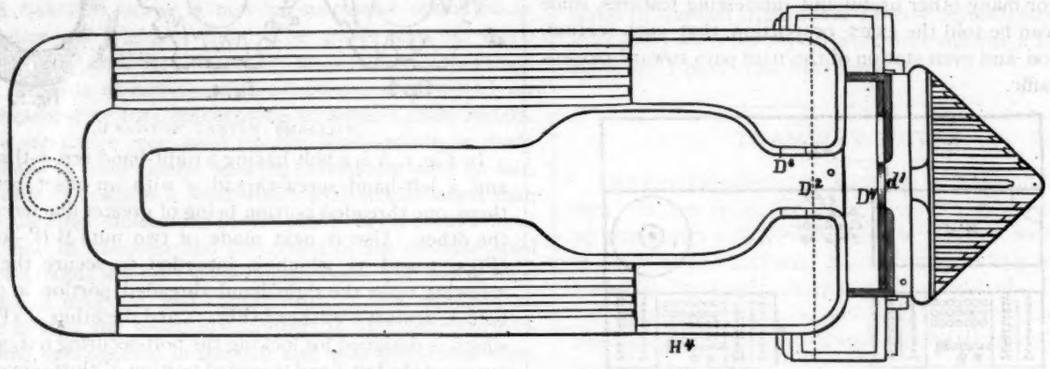
The nut-lock can be applied to railway rail-joints, to holding piston-heads in engines, and cup-heads in pumps, and in a number of cases where an immovable nut is required.

Mealey's Car-coupler.

JOHN MEALEY, of Prescott, Ontario, Canada, has contributed another automatic car-coupler to the increasing number of railway inventions, and in many respects it presents novel features. In this device the coupling-pin extends horizontally through the draw-head, the latter being provided with two vertical slots. In one of these slots is attached a curved hook, while the other receives

the corresponding hook on the approaching draw-head. When the draw-heads come together the two hooks are forced up and over the coupling-pins, and falling into place, the cars are coupled automatically. The cars are uncoupled by means of a chain and lever attachment extending to the top of the car and also to the sides, thus obviating the necessity of brakemen going between the cars. The draw-heads are also arranged for the ordinary link-and-pin coupling, a cylindrical slot being made through the draw-head between the before-mentioned vertical slots, which receives the coupling-pin in the usual manner, while on the face of the draw-head is provided a horizontal slot to receive the link.

The inventor has also added an improvement to the device in providing a sliding step on the top of the car, projecting forward to close the opening between the cars, this step being provided with a spring which keeps it in the desired position, while giving it the necessary play.



ROTHROCK'S IMPROVED LOCOMOTIVE AND STEAMBOAT BOILERS. FIG. I.

Rothrock's Improved Locomotive and Steamboat Boilers.

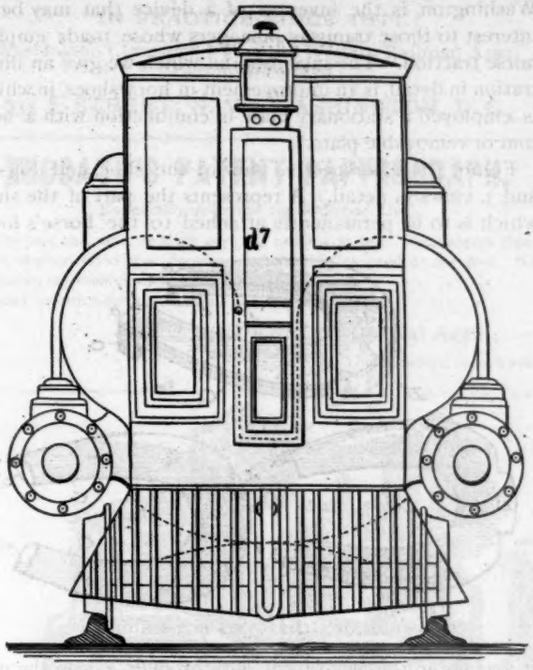
OSCAR ROTHROCK, of Beech Creek, Pa., whose patent safety devices for locomotive-pilots were described in the last number of the JOURNAL, is also the inventor and patentee of certain improvements in locomotive and steamboat boilers which are herewith described and accompanied with explanatory illustrations. The invention relates essentially to locomotive boilers; but it is applicable to portable or stationary engines generally, and peculiarly to small steam-yachts where economy of space is desirable, and where the cabins and state-rooms are to be kept neat and clean and as far as possible from contact with the fuel. A further advantage is derived in overcoming the difficulty of ballasting small steam navigating vessels. In the old way the weight is periodically changed, as in the case where the fuel is all consumed and loaded up again which causes a displacement in one end of the vessel, the boiler and operating machinery being in the other, thus causing an uneveness of the set of the boat in the water. In the construction of boiler here described all the machinery may be centrally located in the vessel, the central depression between the twin boilers forming the fuel space, so that as the fuel is gradually used up the boat becomes lighter, without its evenness or set in the water being disturbed. Thus is combined with the construction of boiler the manifold advantages of having all the machinery, the boiler and its fuel in one compact section, and occupying but little space. A further object of the invention is economy in fuel which is obtained by enlarging the heating surface and fire chamber of the boiler.

Figure 1 represents a horizontal longitudinal section of the boiler with a depression and passage on its top shown in plan, leading to the engine-room, and also a plan view of the fire-box. Fig. 2 is a front elevation showing the cab or housing extending down upon a platform located in front of the fire-box and provided with an entrance door. Fig. 3 is a vertical cross-section of the boiler as applied to a vessel or boat, the arrangement of which will be readily understood. The reference lettering is the same through the illustrated diagrams.

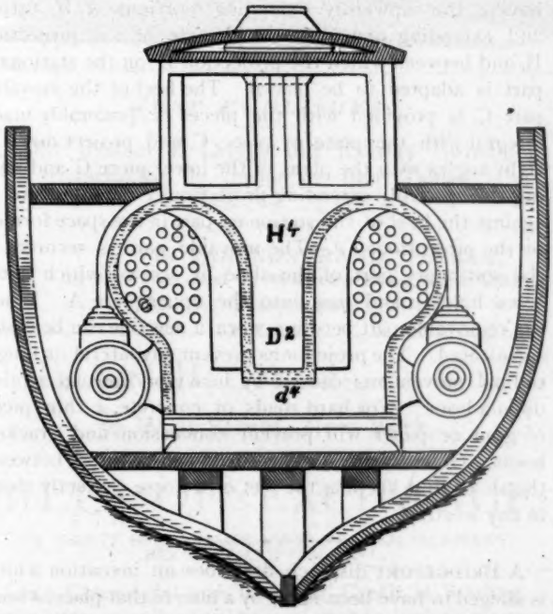
Instead, as heretofore, of securing the cylinders to the engine-frame or to the smoke-box, they are in this case secured to the water legs of the boiler by means of which much radiation of heat heretofore lost is prevented by the close proximity of the steam-cylinder to the fire-box where the air is constantly of increased temperature. The platform D_4, is located immediately in front of the boiler fire-box and leads into the engine-room, or into the reservoir or passage between the boilers. The pendent double water partition may extend to the grate, but preferably in the form shown. The cab extends in front of the fire-box and encloses the platform D_4, which increases the size of the engine-room, and is provided with front and side doors d_7, so as to enable the engine attendants to have ready access between the boilers, and to the working machinery generally. The top, front and the lining of the passage in the fire-box is formed by a water jacket H^4, which may communicate either with the water or steam space of the boiler, but preferably with the water space whereby advantage is taken of the well-known effects of water circulation. The boilers run parallel to each other and are provided with tubes which either lead to a smoke-box common to both, or they may be provided with separate smoke-stacks. The upper portion of the fire-box being divided into two chambers, each chamber must have separate fuel doors D_6, and which may be fired or stoked alternately.

The advantages of the enlarged fire-space and heating surface as compared with narrow and contracted fire-boxes are well known; but it may be said generally, that when a bed of fuel is very deep and the air to support combustion is supplied from below the grate, the air is nearly all consumed before it reaches the fuel on the surface of the

fire; thence the layers of fuel lying in the upper portion of the fire-box are without air, and thus the gases generated from them pass into the open atmosphere unconsumed. But with the enlarged fire-space shown in the drawing and with the fuel evenly spread over the grate surface to the required depth, the air has full access to all the fuel alike, and thus an even fire is maintained, all the gases are consumed and the annoyance of smoke is obviated. Therefore it will be seen that with a perfect combustion is had an economy of fuel, and a more intense heat. The heat being uniform, expansion and contraction of the boiler seams are prevented.



ROTHROCK'S IMPROVED LOCOMOTIVE AND STEAMBOAT BOILERS.
FIG. 2.



ROTHROCK'S IMPROVED LOCOMOTIVE AND STEAMBOAT BOILERS.
FIG. 3.

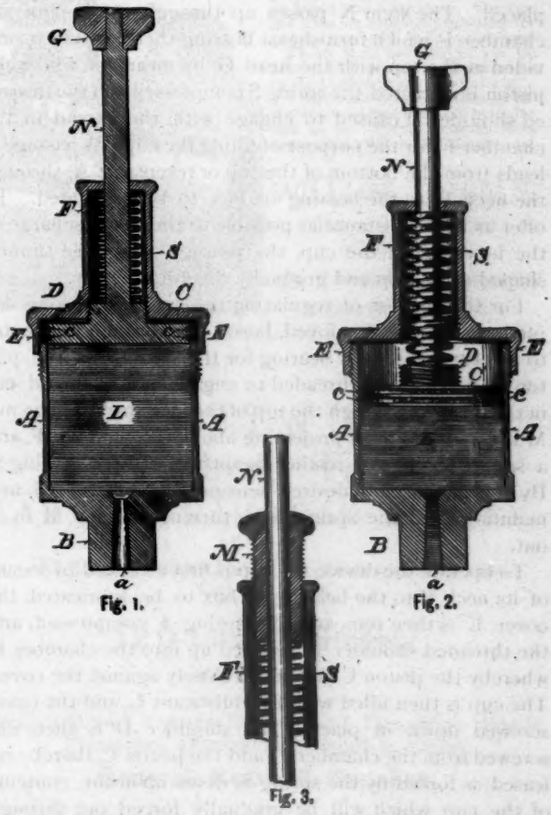
The circulation of water between the boilers through the chambered pendent partition is so great that all parts of the boiler is of even temperature. The currents of water are so rapid and cleansing that sediment has no time to settle and thus incrustation is prevented. Should it be necessary to blow off the boiler, the water in the jacket surrounding the boilers will be found sufficient to supply the boilers until steam is again raised to work the pump or injection until a new supply is obtained.

The pendent partition is flaring from its front to the rear of the fire-box, the flaring or diverging sides retarding to a considerable extent the gases arising from the green fuel fed at the front of the furnace; and by this retardation, time is given them for ignition, thus affording means for preventing the escape of unconsumed gases.

The inventor has procured patents for his invention in the United States, Canada and Germany.

Felthousen's Automatic Lubricating Cup.

BARRENT W. FELTHOUSEN, of Milwaukee, Wis., is the inventor and patentee of an automatic lubricating cup which is herewith illustrated and described. It consists of a cup or receptacle provided with a self-packing piston fitted to slide up and down in the cup, together with a spring to force the piston down upon the contents of the cup and feed the same until it has all been expelled from the cup. Its object is a cup for grease, heavy oils, and lubricating compounds, which may be automatically fed



FELTHOUSEN'S AUTOMATIC LUBRICATING CUP.

by the continuous expansive force of a spring compressed when the cup is filled. Figure 1 is a medial vertical section of the device, showing the method of filling the cup and compressing the spring. Fig. 2 shows the cup in operation; and Fig. 3 a slight modification for regulating the tension of the spring. The reference-lettering is similar in the three figures.

A is the cup proper, cylindrical in general form, provided with the neck B, by means of which it is secured to the box or bearing to be lubricated, and externally threaded about its upper end to receive and engage with the internally-threaded cover E. C is a piston adapted to slide up and down within the cup A, and provided with the stem N, about which is placed the spiral spring S, while *c c* are annular channels or grooves formed in the outer bearing-face of the piston C, which form an air-packing and prevents the oil or lubricant from leaking past the piston. A small vertical cylindrical chamber, F, is formed upon the cover E, for the reception of the spring S, which bears above against the top of the chamber and below against the top of the piston C, or against the shoulder D, raised upon the piston about its stem N. The shoulder D is threaded to engage with a screw-thread cut in the lower end of the chamber F, whereby the piston is held close up to the cover E while the cup is being filled and the cover replaced. The stem N passes up through the top of the chamber F, which furnishes a bearing therefor, and is provided at the top with the head G, by means of which the piston is retracted, the spring S compressed and the threaded shoulder D caused to engage with the thread in the chamber F, for the purpose of filling the cup. A passage *a*, leads from the bottom of the cup or receptacle A, through the neck B, to the bearing or box to be lubricated. To offer as little resistance as possible to the free discharge of the lubricant in the cup, the passage *a* is made tunnel-shaped at the top and gradually diverging below.

For the purpose of regulating the spring S, a long adjusting-nut M, is employed, bored out through the center to receive and form a bearing for the stem N of the piston, and externally threaded to engage with a thread cut in the opening through the top of the chamber F. The nut M has a milled head projecting above the chamber F, and a square-faced end resting against the top of spring S. By this means any desired tension may be secured and maintained in the spring S by turning the nut M in or out.

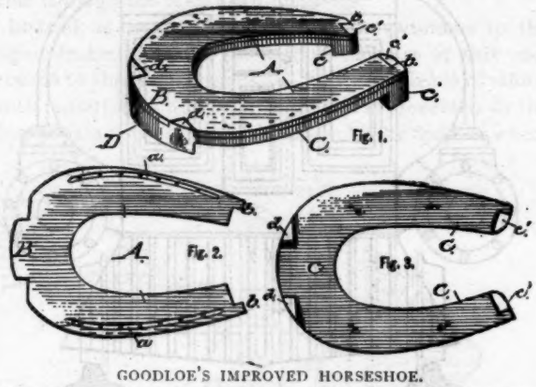
To operate the device the cup is first attached by means of its neck B to the bearing or box to be lubricated, the cover E is then removed, the spring S compressed, and the threaded shoulder D screwed up into the chamber F, whereby the piston C is held up closely against the cover. The cup is then filled with the lubricant L, and the cover screwed down in place. The shoulder D is then unscrewed from the chamber F, and the piston C, thereby released, is forced by the spring S, down upon the contents of the cup, which will be gradually forced out through the passage *a* as it is needed until the cup is emptied. Thus a lubricating cup is furnished which by means of a constant automatic spring pressure, will feed the lubricating compound when the cup is nearly empty as well as when it is full.

The inventor has assigned the patent rights to Messrs. Wadhams, Magie & Co., dealers in oils and lubricants, of Milwaukee, Wis.

An Improved Horseshoe.

MAJOR G. C. GOODLOE, of the U. S. Marine Corps at Washington, is the inventor of a device that may be of interest to those tramway managers whose roads employ horse traction. The invention, of which we give an illustration in detail, is an improvement in horseshoes, in which is employed a stationary plate in conjunction with a bottom or removable plate.

Figure 1 is a perspective view of the shoe, and Figs. 2 and 3, views in detail. A represents the part of the shoe which is to be permanently attached to the horse's foot.



GOODLOE'S IMPROVED HORSESHOE.

It is made in the usual form, with grooves *a a* on the under side, in which the heads of the nails are placed. At the toe of the shoe A, the parts on each side thereof are cut away to form the projection B, and the heels are also cut away to leave projections *b b*, as shown in Fig. 2. C represents the movable part of the shoe, formed similar to the upper stationary part, but with a toe-piece D, having the upwardly extending portions *d d*, fitting and extending upward on each side of the projection B, and between which the projection B on the stationary part is adapted to be placed. The heel of the movable part C, is provided with the pieces *c c*, preferably made integral with the plate or piece C, and project down at right angles with the plane of the lower piece C, and having the upwardly extending projections *c c*, adapted to fit against the heel of the stationary part in the space formed by the projections *b b*. The movable part is secured to the stationary part of the shoe by screws, which enter screw holes *e*, and pass into the upper piece A. When the removable part becomes worn, a new one can be easily substituted. The projections prevent any lateral or longitudinal movements caused by heavy or unusual strains upon a horse. For hard roads, or concrete, a thin piece of gum or paper will prevent concussion and cracked hoofs. Gum, leather, or sheet iron can be used between the shoes thus keeping the feet of a horse perfectly clean in any weather.

A BRIDGEPORT dispatch describes an invention which is alleged to have been made by a man in that place, whose name is said to be Rosenfelt. According to the statement it is a pilot for locomotive engines which, instead of killing people it meets on the track, lifts them gently off. It is described as fitted with spring cushions and as having been tested first on chickens and dogs, and then on human beings.